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Remedial Investigation Report
Solid Waste Management Unit (SWMU) 6
Former Naval Ammunition Support Detachment, Vieques Island, Puerto Rico

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Resumen Ejecutivo

La Unidad de Manejo de Desperdicios Sólidos 6 (SWMU, por sus siglas en inglés) es el antiguo sitio de disposición de desperdicios sólidos en el Antiguo Destacamento Naval de Apoyo de Municiones (NASD, por sus siglas en inglés) en la parte oeste de la isla de Vieques, Puerto Rico. En abril del 2004, el borrador al Reporte de la Investigación para la Remediación (RI, por sus siglas en inglés) para SWMU 6 fue sometido para revisión de las agencias reguladoras. Principalmente se colectaron muestras de suelo adyacentes a las pilas de desperdicios en vez de tomarlas directamente de los desperdicios (debido a preocupaciones de seguridad); basándose en aquellos datos se llegó a la conclusión de que los sitios no representan un riesgo inaceptable a la salud humana o al ambiente. Aunque que incertidumbre es inherente (y en cierto nivel, aceptable) en todos los hallazgos, conclusiones, y decisiones hechos en la investigación ambiental y el proceso de remediación, la Marina y las agencias reguladoras están de acuerdo de que la incertidumbre asociada de que los desperdicios pueden presentar una futura fuente de contaminación (y riesgos potenciales asociados) no es aceptable.

En el 2005, la Marina, la Agencia de Protección Ambiental de los Estados Unidos Región II (USEPA, por sus siglas en inglés), y la Junta de Calidad Ambiental de Puerto Rico (PREQB, por sus siglas en inglés) acordaron que una acción de remoción de desechos, en conjunto con una caracterización de desechos robusta y un protocolo de confirmación de muestreo, atenderían la duda asociada de que los desechos representan una posible fuente de contaminación futura y asegurará que las concentraciones remanentes protejan a la salud humana y al ambiente. Antes de la acción de remoción, se colectarán muestras de suelos a través del área de disposición (incluyendo dentro de las pilas de desechos) para determinar la(s) alternativa(s) de disposición adecuadas.

Luego de la acción de remoción, se colectarán muestras confirmatorias de las áreas excavadas y se realizará una evaluación de riesgo para asegurar que las concentraciones residuales protegen a la salud humana y al ambiente. La evaluación de riesgo tomará en consideración la información presentada en el Plan Abarcador de Conservación para Refugio de Vida Silvestre de Vieques provisto por el Departamento del Interior (DOI, por sus siglas en inglés). Además, la evaluación de riesgo se llevará a cabo de acuerdo con los protocolos ecológicos de evaluación de riesgo para la salud humana del Plan Maestro del Proyecto de Control de Calidad (QUAPP por sus siglas en inglés) (CH2M HILL, Mayo 2006), el que se revisará según sea aplicable en base a con los comentarios de las agencias reguladoras.

Para poder enfocar de una manera más eficiente los recursos; lograr la remoción de los desechos en el SWMU 6 a tiempo y confirmar que las concentraciones residuales protegen a

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la salud humana y al ambiente, se finalizó el borrador de este reporte tal y como fue presentado originalmente con las siguientes modificaciones:

Todos los comentarios de las agencias se presentan en el Anejo M.

- Debido a que la evaluación de riesgo para SWMU 6 se llevará a cabo nuevamente utilizando los datos confirmatorios colectados como parte de la acción de remoción, la evaluación de riego para salud humana y la evaluación del riesgo ecológico se han pasado al Anejo L, ayudando así a enfatizar que éstos serán obsoletos luego de la acción de remoción, además del hecho de que los hallazgos no son la base para conducir la acción de remoción (ej. se realiza la remoción para atender la incertidumbre de que los escombros sean una fuente posible de contaminación futura).
- En vez de atender los comentarios individuales de las agencias, los temas de los comentarios sustanciales (ej. incertidumbres asociadas con las localizaciones de muestreo, conclusiones relacionadas a riesgos potenciales, etc.), se reconocen insertando texto (y borrando alguno) a través de este reporte para demostrar que los hallazgos/conclusiones a la que llegó por la Marina en el reporte borrador no necesariamente están de acuerdo con las agencias reguladoras, aunque las incertidumbres asociadas con las pilas de desechos serán atendidas por la acción de remoción.

El sitio está localizado en el área de los terrenos transferidos a DOI. SWMU 6, el sitio de Disposición Vertedero en los Manglares; fue utilizado por el Antiguo NASD para la disposición de desechos genéricos y sólidos durante los años 1960 y 1970. SWMU 6 es un mangle pantanosos relativamente llano localizado aproximadamente 100 pies al sur del Pasaje de Vieques. El sitio está justo sobre en un área de 1 acre y está rodeado al oeste por un canal que conecta con el norte y con el sur de la Laguna Kiani. La autopista 200 corre de este a oeste a través de la punta sureste del sitio. Una zanja pequeña llena de agua generalmente corre paralela a la frontera este del sitio. Los desechos en el sitio se extienden de 100 a 200 pies norte-noreste de la autopista 200. Los desperdicios desechados en el sitio incluyen contenedores de lubricantes vacíos, aceite, solventes, y pinturas, vidrios, y cascajo. Actualmente, la mayor parte, sino todos los artículos desechados están deteriorados debido a la corrosión natural en el ambiente salino; los desechos se encuentran mayormente en pedazos metálicos pequeños o escombros de cristal. Durante las dos evaluaciones realizadas no se han identificado municiones ni explosivos de preocupación (MEC, por sus siglas en inglés) en SWMU 6. Sin embargo, se identificaron artículos de municiones tales como bombas de prácticas inertes llenas de concreto, dispensadores de bombas vacías, y casquillos vacíos, éstos nuevamente en condiciones muy deterioradas.

El norte, el sur de la Laguna Kiani y el canal son adyacentes al sitio y están conectados directamente al Pasaje de Vieques. El agua de las lagunas se sube y baja con la marea y a veces cubre con agua porciones del sitio.

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Dentro del sitio, el agua subterránea local fluye dependiendo de las fluctuaciones de la marea. Un estudio de la marea indicó que el agua subterránea también sube y baja de acuerdo a estos ciclos. El agua subterránea del sitio contiene altos disolventes sólidos (TDS, por sus siglas en inglés) que indican la presencia de agua salina.

Investigaciones ambientales previas de los sitios en el SWMU 6 incluyen un Monitoreo Ambiental Base (EBS, por sus siglas en inglés) y una Evaluación Preliminar Extendida/Investigación del Sitio (PA/SI, por sus siglas en inglés). Los resultados de ambas investigaciones se ha incorporado en este reporte RI. El muestreo para este RI fue descrito en un plan de trabajo (CH2M HILL, 2003b) revisado por el Comité de Revisión Técnica (CTC por sus siglas en inglés) de Ley de Respuesta Ambiental, Responsabilidad y Compensación Comprensiva (CERCLA, por sus siglas en inglés). Debido a preocupaciones de seguridad, se colectaron las muestras adyacentes a las pilas de escombros, en vez de tomar muestras directamente de los escombros. Es posible que las concentraciones de constituyentes dentro y bajo las pilas de desechos sean diferentes (ej. más altas o más bajas) de aquellas muestras colectadas adyacentes a las pilas de desechos. Por lo tanto, hay incertidumbres sobre si las conclusiones descritas en el borrador del reporte respecto a la salud humana y riesgo ecológico serían las mismas si se hubiesen colectado e incluido en la evaluación muestras de dentro y bajo las pilas de desechos. Se contestarán estas incertidumbres con la acción de remoción, los protocolos de confirmación y caracterización asociados con los desechos, y las evaluaciones de riesgo residuales.

Se llevó a cabo este RI con el objeto de suplementar investigaciones previas para: (1) caracterizar la naturaleza y extensión de la contaminación ambiental asociada con el sitio, y (2) evaluar si los contaminantes relacionados con el sitio presentan un riesgo inaceptable para la salud humana y el ambiente.

Resumen de las Actividades de las Investigaciones para la Remediación

Para alcanzar los objetivos de RI, se completaron varios trabajos incluyendo los siguientes:

- Evaluación geofísica para delinear la extensión de los desechos depositados en el sitio y para confirmar que no hubiesen MEC presentes en el área evaluada alrededor de las localizaciones de muestreo.
- Recolección e interpretación de los datos de los niveles de aguas subterráneas en SWMU 6 y de los canales de mareas y lagunas cercanas para establecer los efectos de los niveles dinámicos de las aguas subterráneas y los efectos de la marea sobre ellos.
- Instalación de dos pozos de monitoreo relacionados al sitio y dos pozos de monitoreo de trasfondo permanentes para suplementar los cuatro pozos de monitoreo construidos durante la caracterización del sitio (SC por sus siglas en inglés) y PA/SI Extendido.
- Recolección de muestras de aguas subterráneas de cuatro pozos de monitoreo existentes y de dos pozos de monitoreo recién instalados en el sitio para análisis y reportes de laboratorio.

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- Recolección de 15 muestras de suelos superficiales para determinar si la contaminación del suelo se extendió horizontalmente desde la fuente.
- Recolección de muestras de aguas superficiales para análisis de laboratorio y reportes, y para suplementar los datos de SC y PA/SI, 5 muestras del sitio y 2 muestras de trasfondo específicos del sitio, más 12 muestras de sedimento del sitio y 2 del sedimento de trasfondo del sitio específico.
- Recolección de muestras de trasfondo de aguas subterráneas específicos del sitio, sedimentos, y aguas superficiales para ser comparadas con las concentraciones de sustancias inorgánicas detectadas en estos medios en SWMU 6.
- Ejecución completa de los análisis de laboratorio de muestras de suelos, aguas subterráneas, sedimentos y muestras de aguas superficiales recolectadas para metales, compuestos orgánicos volátiles (VOCs por sus siglas en inglés), compuestos orgánicos semi-volátiles (SVOCs por sus siglas en inglés), pesticidas, bifenilos policlorinados (PCBs por sus siglas en inglés), y explosivos.

El RI se completó de acuerdo con las provisiones de CERCLA y siguiendo la guía interina *Guidance for Conducting Remedial Investigations and Feasibility Studies* de la Agencia de Protección Ambiental (EPA) bajo *CERCLA* (EPA, 1988). Para evaluar si se requiere una evaluación de riesgo detallada, los datos analíticos se compararon con las Metas de Remediación Preliminares de la EPA Región 9 (PRGs por sus siglas en inglés y con los criterios de evaluación ecológica.

Resumen de la Naturaleza y Extensión de la Contaminación

Aquí se presenta un resumen de la naturaleza y extensión de la contaminación en base a la distribución de muestras del PA/SI y RI Extendido. Se debe notar que la representación de la naturaleza y extensión no incluye datos de las pilas de desechos en sí, por lo que es posible que se pudieran haber detectado niveles de constituyentes más altos de dentro o directamente bajo las pilas de desechos. Se atenderá esta incertidumbre a través de la acción de remoción y del protocolo de caracterización y confirmación de desechos de muestreo asociados, cuyos los resultados se presentarán en un reporte de la acción de remoción.

Los resultados analíticos de las muestras de suelo de superficie muestran que siete metales (antimonio, arsénico, cobre, hierro, plomo, talio, y zinc) excedieron los niveles de trasfondo y los criterios de evaluación (que incluyeron PRGs basados en la protección a la salud humana, valores de protección ecológicos y valores de lixiviación de suelo a aguas subterráneas). Se detectaron niveles de hierro y otros metales en la porción noroeste del sitio (ver Figura 4-1), particularmente en muestras NDW06SS01 y NDW06SS23. Estas muestras están localizadas dentro del área donde hay presencia de desechos de metales; por lo tanto, las actividades de disposición de desperdicios pueden tener un impacto limitado en la superficie de los suelos en esta área. Las sustancias químicas en los suelos superficiales que

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se detectaron sobre los criterios de evaluación se incluyeron en la evaluación de riesgos ecológicos y en la evaluación para la salud humana.

Los resultados analíticos de las muestras de suelos bajo la superficie muestran que de los 22 metales detectados, sólo antimonio sobrepasó los niveles de criterios de evaluación y los de trasfondo. Basado en este excedente aislado de antimonio en los suelos bajo la superficie, las actividades de disposición de desperdicios pudieron haber tenido un impacto limitado estos suelos. Los suelos bajo la superficie se atendieron en la evaluación de riesgos ecológicos y para la salud humana.

Según se presenta en las Tablas 4-7 y 4-12 y en la Figura 4-5, se detectaron varios químicos orgánicos e inorgánicos en el agua subterránea del sitio sobre los niveles de trasfondo y los PRGs para agua consumo. Cloroformo es una de sustancias orgánicas que se encontraron en un pozo. No se encontraron dos detecciones previas de PCBs en este muestreo. Estas sustancias se incluyeron en la evaluación de Riesgos a la Salud Humana (HHRA por sus siglas en inglés). Los resultados analíticos de las muestras de aguas subterráneas sin filtrar (total) y filtradas (disueltas) muestran que las concentraciones de antimonio, arsénico, cadmio, cromo, hierro, plomo, manganeso, selenio y talio sobrepasaron los criterios de evaluación y los niveles de trasfondo en uno o más pozos del sitio. Todos los metales totales detectados se incluyeron en la HHRA), sin embargo las aguas subterráneas del sitio poseen totales de disolventes sólidos altos (TDS), que indican agua salina no es apta para uso potable.

Los resultados analíticos de las muestras de aguas superficiales mostraron varios metales sobre los criterios de evaluación y niveles de trasfondo. Por lo tanto, éstos fueron incluidos en el HHRA y en la evaluación de riesgo ecológico (ERA por sus siglas en inglés).

Las muestras de sedimentos recolectadas del canal que conecta con el norte y sur de la Laguna Kiani mostraron que las concentraciones de varios químicos inorgánicos y los siguientes pesticidas DDD, DDE, y DDT sobrepasaron los criterios de evaluación ecológicos. Todas las sustancias químicas detectadas sobre los criterios de evaluación se incluyeron en el ERA y HHRA.

En resumen, los resultados analíticos indican que el sitio posee metales y algunas sustancias orgánicas detectados en los suelos, aguas subterráneas, aguas superficiales y sedimentos. Todas las sustancias químicas detectadas fueron identificadas para seguir con más evaluaciones de riesgo. El transporte y destino potencial de las sustancias químicas detectadas sobre los criterios de evaluación y concentraciones de trasfondo se presentan en la Sección 5 y se resumen a continuación.

Resumen del Transporte y Destino de los Contaminantes

Este es un resumen del destino y transporte de los constituyentes, principalmente aquellos identificados como contaminantes en base en la distribución de muestreas del PA/SI y RI Extendido. Se reconoce que hay algunas incertidumbres asociadas con los constituyentes

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identificados como contaminantes y sus concentraciones asociadas, debido a que las muestras del suelo no se colectaron directamente de las pilas de desechos. Es posible que contaminantes adicionales, o contaminantes con concentraciones más altas pudiesen haber sido identificados bajo esas circunstancias. Sin embardo, la discusión general del destino y transporte es adecuado si se basa en la data recolectada. Mas aún, la acción de remoción atenderá la contaminación presente en los desechos, la cual atenderá la incertidumbre asociada con los tipos y niveles de contaminación asociados a su destino y transporte.

Se realizó una evaluación de destino y transporte para los contaminantes potenciales en SWMU 6. El pasaje migratorio primario para el transporte de contaminantes del área de disposición es a través de lixiviación de contaminantes de la superficie y desechos sumergidos enterrados en los suelos, y de ahí a las aguas subterráneas y también a través de escorrentías hasta el canal y las zanjas. Basado en posibles pasajes migratorios y características químicas, parece que algunas sustancias químicas pudieron escaparse del sitio durante las actividades de disposición y luego transportadas a los suelos de bajo la superficie, aguas subterráneas, aguas superficiales o sedimentos. Ocasional e inconsistentemente se han detectado cloroformo, Aroclor 1221, Aroclor 1232, y perclorato en las aguas subterráneas. La fuente de estas sustancias químicas puede estar no relacionada al sitio. Ya que bis (2 ethylhexyl) phthalate es un contaminante común de laboratorio, la fuente en el medio del sitio es cuestionable.

Los metales son comunes en los sitios en todos los medios ambientales. Se detectaron ocho metales (arsénico, antimonio, cadmio, cobre, hierro, plomo, talio, y zinc) sobre los niveles respectivos de trasfondo en suelos superficiales, o en los suelos bajo la superficie; todas los demás sustancias inorgánicos en la superficie y bajo las superficie estaban por debajo de sus respectivas concentraciones de trasfondo. La mayoría de las sustancias inorgánicas en el sitio parecen ser parte del trasfondo. El destino y transporte de metales es difícil de predecir. La persistencia y movilidad de los metales depende de varios factores, incluyendo el potencial de reducción de la oxidación (ORP por sus siglas en inglés), pH, formaciones complejas de metal, estado de valencia del metal, arcilla, materia orgánica, y óxidos de hierro y manganeso. El acuífero poco profundo en el sitio parece estar bajo condiciones reducidas, con datos que indican que una reducción de manganeso, hierro y sulfato pudiese estar ocurriendo dentro del acuífero. La mayoría de los metales detectados en la superficie del agua se absorben principalmente en materia particulada y orgánica, siendo su biodisponibilidad más baja que en su forma disuelta. También es posible que los metales que se observan en las aguas subterráneas en el sitio se deban a procesos geoquímicas que ocurren en los ambientes de los suelos bajo la superficie de los sitios.

Se condujo un HHRA y un ERA para todas las sustancias químicas detectadas sobre los criterios de evaluación.

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Resumen de la Evaluación de Riesgo a la Salud Humana

Este es un resumen de la evaluación de riesgo a la salud humana que se llevó a cabo para SMWU 6 que se basa en la evaluación de los datos obtenidos de la distribución de las muestras previamente discutidos. Se debe notar que la evaluación de riesgo no se aplica para las concentraciones de los constituyentes de suelos dentro y bajo las pilas de desechos, por lo que hay incertidumbres relacionadas con los constituyentes de preocupación (COPCs por sus siglas en inglés) identificados y las conclusiones de la evaluación de riesgo en base a estos COPCs. Sin embargo, estas dudas serán atendidas a través la acción de remoción y su protocolo de caracterización y confirmación de muestreo asociados.

Los medios de exposición del sitio evaluados fueron suelos superficiales, suelos bajo la superficie, sedimentos, aguas de superficie y aguas subterráneas. Todas las sustancias químicas detectadas en el PA/SI y el RI Extendido se incluyeron para selección de COPCs. La concentración química máxima detectada fue comparada contra los criterios de evaluación en el *EPA Risk Assessment Guidance for Superfund (RAGS)* Parte D, tablas presentadas en el Anejo L de este reporte RI.

Las sustancias químicas identificadas como COPCs en suelos fueron sustancias inorgánicas y SVOCs (Hidrocarburos poli-aromáticos (PAHs por sus siglas en inglés)), cloroformo; hay una detección histórica de PCBs y sustancias inorgánicas en aguas subterráneas, un SVOC y metales en sedimentos, y sustancias inorgánicas en aguas superficiales.

El DOI condujo una investigación limitada de las concentraciones químicas muestreando dos cangrejos de tierra y una muestra compuesta de cangrejos violinistas. El tejido del cangrejo de tierra indicó la presencia de tres metales, y uno de los cangrejos de tierra tenía dos pesticidas clorinorgánicos. El propósito de este muestreo fue el evaluar el impacto potencial de la disposición de desechos a las áreas ecológicas receptoras; por lo tanto, durante el muestreo de DOI sólo se midieron niveles de sustancias totales del cuerpo de estos cangrejos. Así que, puede que no sea adecuado incluir estos resultados para las evaluaciones de impactos a la salud humana por el consumo de los tejidos comestibles, ya que las muestras de DOI representan concentraciones de los cuerpos enteros. Como una evaluación conservadora, se hizo una comparación a los PRGs calculados (ver Anejo I). Los metales no excedieron estos PRGs; entonces el consumo ilimitado de cangrejos no es indicado debido a la presencia de pesticidas. Además, el sitio al parecer no apoya la ingestión ilimitada de cangrejos debido a que es un área pequeña y no hay muchos. Estos pesticidas se encuentran comúnmente en áreas generales posiblemente debido al uso de estas sustancias en el pasado como control de plagas en la agricultura o tipos de actividades de mantenimiento de facilidades durante las pasadas operaciones de la Marina.

La HHRA evaluó la exposición de poblaciones potenciales receptoras al sitio incluyendo trabajadores de mantenimiento, trabajadores industriales, trabajadores de construcción, receptores recreativos, y receptores residenciales. El riesgo de cáncer estimado en los suelos está dentro de los límites meta para todos los receptores. El índice de amenaza (HI por sus siglas en inglés) sobrepasó los límites meta para niños residenciales debido a la presencia de

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hierro y vanadio en los suelos. Además, el riesgo de cáncer para residentes adultos (1.1E-03) y HI (7.0) por exposición a aguas subterráneas a través de uso potable sobrepasaron los límites debido a los niveles de arsénico. De igual manera, los riesgos cancerígenos y el HI se encontraron sobre los límites meta para un niño residente, debido al arsénico en las aguas subterráneas. El HI de las aguas subterráneas sobrepasó bastante el valor meta de 1.0 debido a la presencia de antimonio, arsénico, cadmio, hierro, manganeso, selenio y talio. Sin embargo, los altos niveles de disolventes sólidos indican que el agua subterránea es similar al agua de mar y no es adecuada para uso potable. Los metales detectados en los pozos del sitio parecen estar asociados con los sólidos suspendidos en las muestras de agua, o debido a los procesos geoquímicos que aumentan las concentraciones de partículas disueltas de algunos de los mayores cationes tales como hierro y manganeso. Los altos niveles de TDS en las aguas subterráneas en esta área podrían prevenir su uso como fuente de agua para tomar, por lo tanto, de ahí que el consumo de esta agua subterránea es poco probable. Las regulaciones de Puerto Rico requieren que las aguas subterráneas con TDS menor de 10,000 mg/L sean consideradas potables. Todas las muestras de aguas subterráneas recolectadas en SWMU 6 poseen concentraciones de cloro mayores de 27,000 mg/L.

En uno de los pozos se detectó Perclorato aunque un re-muestreo no confirmó su presencia. La detección de perclorato es probable que sea un valor positivo falso (DoD, 2002), y por lo tanto, es probable que no hay perclorato presente en el sitio. Históricamente (ej. antes del 2004), el perclorato era comúnmente analizado usando el método analítico 314.0. de EPA . Este método es recomendado para análisis de agua de consumo, pero en el 2004, la EPA y DoD reconocieron que el método es potencialmente dudoso (ej. potencialmente llevando a positivos falsos) para otras matrices, como suelos y aguas subterráneas, especialmente en concentraciones bajas. En junio del 2000, se analizaron cuatro muestras de aguas subterráneas para SWMU 6 y un duplicado para perclorato por el método 314.0 de la EPA. No se detectó perclorato; sin embargo, el límite de reporte fue de 40 ug/l. En septiembre del 2003, se analizaron nueve muestras de aguas subterráneas para el SWMU 6 y un duplicado para perclorato usando un límite de reporte de 20 ug/l. Se registró perclorato a 12.8 ug/l en la muestra recolectada del MW01. En base a la recomendación del DoD de confirmar las detecciones de perclorato por un método analítico alterno (DoD, 2004), se recolectaron dos muestras de aguas subterráneas y dos duplicados de MW01 en febrero del 2004 para análisis simultáneos por los métodos 314.0 y SW846 Método 8321A. Esta limitación de reporte para el método 8321A fue de 2 ug/l, una orden de magnitud más baja que el método 314.0 como resultado de una mayor sensibilidad de los instrumentos. No se detectó perclorato in ninguna de las cuatro muestras. Por lo tanto, MW01 ha sido muestreado múltiples veces para perclorato, el cual fue detectado en sólo una de las muestras usando el método que se sospecha produce positivos falsos. Ambas confirmaciones de los muestreos por el mismo método y también por método más sensible demuestran que la única detección obtenida es probable que sea un resultado positivo falso.

Las sustancias químicas orgánicas en los suelos del sitio, aguas subterráneas, sedimentos y aguas superficiales probablemente no representan riesgos significantes o peligrosos, pero se

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reconoce que esta conclusión respecto a los suelos es incierta debido a que las muestras de suelos fueron recolectadas en áreas adyacentes a las pilas de desechos, en vez de directamente dentro/debajo de ellas. Todas las sustancias químicas adicionales son inorgánicas. Como se explicó anteriormente, es probable que ninguna de las sustancias químicas inorgánicas presenten un riesgo a la salud humana por exposición específica a las operaciones previas en SWMU 6, pero se reconoce que esta conclusión respecto a los suelos es incierta debido a que las muestras de suelos fueron recolectadas en áreas adyacentes a las pilas de desechos, en vez de directamente dentro/debajo de ellas. El agua subterránea del sitio no es potable debido a su alta salinidad, es posible que los potenciales escenarios (asunciones) utilizados en la evaluación de riesgo sean muy conservadores. Debido a la probable ausencia de riesgos específicos del sitio sobre los niveles de trasfondo y en base as las evaluaciones de riesgo no se propondrá el sitio para más investigaciones o implementación de acciones de remediación. Sin embargo, debido a la incertidumbre asociada con las conclusiones de riesgo y que los escombros pueden ser una fuente potencial de contaminación, las agencias han acordado que para atender las incertidumbres y asegurar que las concentraciones residuales del medio en el sitio protejan la salud humana, se llevará a cabo una acción de remoción.

Evaluación de Riesgo Ecológico

Aquí se resume de la evaluación de riesgo ecológico realizada para el SWMU 6 en base a los datos de la distribución de muestras presentadas previamente. Se debe notar que la evaluación de riesgo no toma en consideración concentraciones potencialmente más altas de constituyentes de suelos dentro y debajo de las pilas de desperdicios, por lo tanto hay incertidumbres asociadas con los COPCs identificados, en los que se basa en la conclusión de la evaluación de riesgos. Sin embargo, estas dudas serán atendidas vía la acción de remoción y su protocolo de caracterización y confirmación de muestreo asociados. Se realizó el ERA para SWMU 6 de acuerdo con *Navy Policy for Conducting Ecological Risk Assessments* (CNO, 1999) y el EPA *Ecological Risk Assessment Guidance for Superfund* (EPA, 1997). SWMU 6 no ha sido relativamente perturbado desde finales de los 1970s, y la vegetación del sitio consiste ahora de extensas comunidades de mangles negros y rojos. El SWMU 6 se encuentra adyacente al sur de la Laguna Kiani. Un canal que se abre al pasaje de Vieques se encuentra justo al oeste del sitio y conecta con la Laguna Kiani. Este sitio es hábitat muy próspero para las plantas, invertebrados, pájaros y comunidades de mamíferos. El hábitat acuático salino adyacente asociado con el sistema de la Laguna Kiani es apoyo para los peces, invertebrados (ej. ermitaños y cangrejos de tierra), plantas acuáticas (mangles), y comunidades de pájaros semi-acuáticos. Una verja encadenada se extiende a lo largo del lado sur del sitio, a lo largo de la autopista 200, previene el acceso humano pero no limita el acceso a la vida silvestre; otros lados del sitio ofrecen puntos de acceso sin restricciones.

La exposición a suelos superficiales, sedimentos, y aguas superficiales fueron evaluados para orgánicos e inorgánicos a través de una evaluación de evaluación y una evaluación de riesgo de línea base. Se evaluó la bio-acumulación potencial de los niveles altos utilizando el modelo trófico de exposición de alimentos. El modelo de red de alimentación utilizó

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asunciones muy conservadoras para químicos de alta toxicidad, dentro del cual estos químicos fueron evaluados para riesgos potenciales usando la mitad de los valores límites de detección, aún cuando éstos no fueron detectados en el sitio.

La evaluación de riesgo de línea base (Paso 3) concluyó que las sustancias químicas identificadas preliminarmente como COPCs en la evaluación de riesgo de los niveles de evaluación (Paso 2) no fueron considerados como COPCs finales siguiendo el refinamiento al Paso 3A, pero se reconoce que esta conclusión respecto a los suelos es incierta debido a que las muestras de suelos fueron recolectadas en áreas adyacentes a las pilas de desechos, en vez de directamente dentro/debajo de ellas.

El memorando preparado para el estudio preliminar conducido por DOI que incluyó tres muestras, dos de cangrejos de tierra y una muestra compuesta de cangrejos violinistas, fue revisado por su aplicación a la evaluación de riesgo ecológico. Un resumen de esta revisión se incluye en el Anejo L. Las concentraciones químicas detectadas por DOI en los tejidos del cangrejo no están a niveles que presenten un riesgo inaceptable para las aves que vagan en este sitio. Sustancias químicas de preocupación potencial en los tejidos de los cangrejos identificados por DOI incluyeron DDE, DDT, cadmio, plomo y vanadio. Se utilizó un cálculo conservador anterior utilizando el modelo de red de alimentación del SWMU 6 ERA (según presentado en el Anejo L) para estimar conservadoramente las concentraciones más altas de estos químicos, que no presentarían un efecto adverso a tres especies de aves, la gran garza azul, la garza coronada amarilla y la garza verde. Una asunción principal del modelo fue que la dieta de estas aves consiste enteramente de cangrejos (no pescado).

Los resultados de este modelo de red alimenticio indicaron que para ambos DDE y DDT, no ocurrirían efectos adversos a estas aves que consuman cangrejos con concentraciones en los tejidos de o menores a 1.03 mg/Kg peso seco (wt). Las concentraciones máximas de DDE y DDT medidas por DOI en cangrejos fueron menores, totalizando 0.52 y 0.11 mg/Kg, respectivamente. Para el cadmio, plomo y vanadio, el modelo indicó que no ocurrirían efectos adversos en las respectivas concentraciones de tejidos de cangrejos de 5.0, 13.3, y 39.5 Kg/Kg peso seco. Las concentraciones máximas medidas en los cangrejos por el DOI fueron menores que esos valores (cadmio = 1.6 mg/Kg peso seco; plomo = 11.7 mg/Kg peso seco; vanadio = 2.63 mg/Kg peso seco).

Por lo tanto, a pesar de los aspectos técnicos e incertidumbres con las muestras de los tejidos de cangrejos, no es probable que las concentraciones detectadas en los tejidos posean un riesgo inaceptable para las aves que vagan en el sitio.

La conclusión general del ERA es que a pesar de que muchos metales y algunas sustancias orgánicas fueron identificadas como COPCs, los riesgos para bajar los niveles de los receptores tróficos fueron insignificantes basados en la baja magnitud de los excedentes de los valores de evaluación y las comparaciones al trasfondo/corriente arriba. Tampoco se identificaron riesgos significantes para la vida silvestre terrestre. Igual que con las conclusiones de evaluación de riesgo a la salud humana, debido a las incertidumbres asociadas con la conclusión de los riesgos ecológicos hechos en el borrador al reporte, las

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agencias han acordado que se llevará a cabo una acción de remoción para atender estas dudas y asegurar que la concentración residual en el sitio protege el ambiente.

Conclusiones y Recomendaciones

Los desechos presentes en el SWMU 6 están significativamente degradados y la mayoría de los remanentes de los artículos son pedazos metálicos pequeños y pedazos de vidrio. El sitio está localizado adyacente a la autopista 200, la cual es una carretera de acceso para el público que usa las playas lejanas en el oeste de esta parte de la isla; por lo tanto, el sitio es altamente visible. Una verja separa el sitio de la autopista 200, limitando su acceso. Mientras la apariencia física de los desechos puede desmejorar la apariencia estética del sitio, los desechos pueden no presentar peligros químicos definidos bajo las regulaciones de CERCLA. Existen incertidumbres asociadas con esta conclusión debido a que las muestras no fueron recolectadas de adentro de la pila de desechos debido a preocupaciones de seguridad. Por lo tanto, basado en los resultados del RI y el uso anticipado de los terrenos del sitio, las condiciones del sitio en SWMU 6 probablemente no presentan un riesgo inaceptable a la salud humana o receptores ecológicos, y no se recomendarán investigaciones adicionales o acciones basados en los resultados de las evaluaciones de riesgo. Sin embargo, debido a que existen dudas asociadas con las conclusiones de riesgo y los escombros como una posible fuente de contaminación, las agencias han acordado llevar a cabo acciones de remoción para poder atender las dudas y asegurar que las concentraciones residuales del medio en el sitio son protectivas a la salud humana y el ambiente.

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Executive Summary

Solid waste management unit (SWMU) 6 is a former solid waste disposal site on the former Naval Ammunition Support Detachment (NASD) in the western portion of Vieques Island, Puerto Rico. In April 2004, the Draft Remedial Investigation (RI) Report for SWMU 6 was submitted for regulatory agency review. Soil samples were collected primarily adjacent to waste piles rather than directly through the waste piles (due to safety concerns), and the conclusions drawn based on those data were that the site does not pose an unacceptable risk to human health or the environment. While uncertainty is inherent (and at some level, acceptable) in all findings, conclusions, and decisions made in the environmental investigation and remediation process, the Navy and regulatory agencies have concurred that the uncertainty associated with the waste representing a potential future source of contamination (and associated potential risks) is unacceptable.

In 2005, the Navy, United States Environmental Protection Agency Region II (USEPA), and the Puerto Rico Environmental Quality Board (PREQB) concurred that a waste removal action, coupled with a robust waste characterization and confirmatory sampling protocol, will address the uncertainty associated with waste representing a potential future source of contamination and ensure residual media concentrations are protective of human health and the environment. Prior to the removal action, soil samples will be collected across the disposal area (including within the waste piles) to determine the appropriate disposal alternative(s).

Following the removal action, confirmatory samples will be collected from the excavated area and a risk assessment will be performed to ensure residual media concentrations are protective of human health and the environment. The risk assessment will take into consideration the information presented in the Comprehensive Conservation Plan for the Vieques Wildlife Refuge provided by the Department of Interior (DOI). Additionally, the risk assessment will be performed in accordance with the human health and ecological risk assessment protocols in the Master Quality Assurance Project Plan (QAPP) (CH2M HILL, May 2006), refined as applicable in accordance with regulatory agency comments.

In order to efficiently focus resources to achieve timely removal of the waste at SWMU 6 and confirm residual media concentrations are protective of human health and the environment, this report has been finalized as originally presented in draft form with the following modifications:

- All agency comments are presented in Appendix M
- Because the risk assessments for SWMU 6 are going to be redone using the confirmatory data collected as part of the removal action, the human health and ecological risk assessments have been relocated to Appendix L to help emphasize that they will be obsolete following the removal action and the fact that their findings are not the basis for conducting the removal action (i.e., removal is being conducted to address uncertainty of debris being a potential future source of contamination).

- Rather than address individual agency comments, the substantial comment themes (e.g., uncertainties associated with sample locations, conclusions regarding potential risk, etc.), are acknowledged by text insertions (and some text deletions) throughout the document to show that the findings/conclusions drawn by the Navy in the draft report are not necessarily concurred upon by the regulatory agencies, but that the uncertainties associated with the waste piles will be addressed by the removal action.

The site is located in the area of the land transferred to the DOI. SWMU 6, the Mangrove Disposal Site, was used by the former NASD for disposal of solid and generic waste during the 1960s and 1970s. SWMU 6 is a relatively flat mangrove swamp located approximately 100 feet south of Vieques Passage. The site is just over 1 acre in area and is bounded on the west by a canal that connects Kiani Lagoon North and Kiani Lagoon South. Highway 200 runs east-west through the southern end of the site. A small water-filled ditch runs generally parallel to the eastern boundary of the site. The waste at the site extends 100 to 120 feet north-northeast of Highway 200. Waste discarded at the site includes empty containers of lubricants, oil, solvents, and paints, broken glass, and rubble. Currently, most if not all of the disposed items have deteriorated due to natural corrosion in the saltwater environment, and wastes are present mostly in small pieces of metallic or glass debris. No munitions and explosives of concern (MEC) have been identified at SWMU 6 during the two surveys conducted. However, munitions-related items such as inert concrete-filled practice bombs, empty bomb dispensers, and empty shell casings were identified, again in very deteriorated condition.

Kiani Lagoon North, Kiani Lagoon South, and the canal are adjacent to the site and directly connected to Vieques Passage. Water from the lagoons rises and falls with the tides and at times covers portions of the site with water.

Within the site, local groundwater flow depends on tidal fluctuations. A tidal study indicated that site groundwater also rises and falls with the tidal cycles. Site groundwater has high total dissolved solids (TDS) indicative of seawater.

Previous environmental site investigations completed at SWMU 6 include an Environmental Baseline Survey (EBS) and an Expanded Preliminary Assessment/Site Investigation (PA/SI). The results of both of these investigations have been incorporated into this RI report. The sampling for this RI was described in a work plan (CH2M HILL, 2003b) reviewed by the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) Technical Committee (CTC). Due to safety concerns, samples were collected adjacent to the debris piles, rather than directly through them. It is possible that the concentrations of constituents within and below the waste piles are different (i.e., higher or lower) from those in samples collected adjacent to the waste piles. Therefore, there is uncertainty whether the conclusions drawn in the draft report with respect to human health and ecological risk would be the same if data from within and beneath the waste piles had been collected and included in the assessment. This uncertainty will be addressed via the removal action and its associated waste characterization and confirmatory sampling protocol, and residual risk assessments.

This RI was conducted to supplement the previous investigations to (1) characterize the nature and extent of environmental contamination associated with the site and (2) assess

whether the site-related contaminants pose an unacceptable risk to human health and the environment.

Remedial Investigation Activities Summary

To meet the RI objectives, tasks were completed that included the following:

- Performance of geophysical surveys to delineate the extent of waste disposed of at the site and to confirm that no MEC are present in the surveyed areas around the sampling locations.
- Collection and interpretation of groundwater level data at SWMU 6 and the nearby tidal canal and lagoons to establish baseline dynamic groundwater levels and tidal effects on them.
- Installation of two site-related and two site-specific background permanent monitoring wells to supplement the four monitoring wells constructed during the site characterization (SC) and Expanded PA/SI.
- Collection of groundwater samples from four existing and two newly installed monitoring wells at the site for laboratory analysis and reporting.
- Collection of 15 surface soil samples to determine whether soil contamination extended horizontally in the source area.
- Collection of 5 site and 2 site-specific background surface water samples and 12 site and 2 site-specific background sediment samples for laboratory analysis and reporting to supplement data from the SC and PA/SI.
- Collection of site-specific background samples of groundwater, sediment, and surface water for comparison with concentrations of inorganic chemicals detected in these media at SWMU 6.
- Completion of laboratory analysis of the collected soil, groundwater, sediment, and surface water samples for metals, volatile organic compounds (VOCs), semivolatile organic compounds (SVOCs), pesticides, polychlorinated biphenyls (PCBs), and explosives.

The RI was completed in accordance with the provisions of the CERCLA and followed the Environmental Protection Agency (EPA) interim final *Guidance for Conducting Remedial Investigations and Feasibility Studies under CERCLA* (EPA, 1988). The analytical data were compared to EPA Region 9 Preliminary Remediation Goals (PRGs) and ecological screening criteria to assess whether a detailed risk assessment is required.

Nature and Extent Of Contamination Summary

The discussion below is a summary of the nature and extent of contamination, based on the sample distribution from the Expanded PA/SI and RI. It should be noted that the representation of the nature and extent does not include data from directly through the waste piles, so it is possible that higher levels of constituents would have been detected within or directly beneath the waste piles. This uncertainty will be addressed via the

removal action and its associated waste characterization and confirmatory sampling protocol, the results of which will be presented in a removal action report.

The analytical results of the surface soil samples show that seven metals (antimony, arsenic, copper, iron, lead, thallium, and zinc) exceeded background levels and screening criteria (which included human health protection-based PRGs, ecological protection values, and soil-to-groundwater leachability values). The elevated levels of iron and other metals were detected in the northwestern portion of the site (see Figure 4-1), particularly in samples NDW06SS01 and NDW06SS23. These samples are located within the area where scrap metal is present; thus, the waste disposal activities may have had a limited impact on the surface soils in this area. The detected surface soil chemicals above screening criteria were included in the human health and ecological risk assessments.

The analytical results of the subsurface soil samples show that of the 22 metals detected, only antimony exceeded background levels and screening criteria. Based on the isolated exceedance of antimony in subsurface soil, the waste disposal activities may have had only a limited impact on subsurface soils. The subsurface soils were evaluated in the human health and ecological risk assessments.

Site groundwater had several inorganic and organic chemicals detected above the background levels and tap-water PRGs, as presented in Tables 4-7 and 4-12 and Figure 4-5. The organic chemicals included chloroform in one well. Two previous detections of (PCBs) were not present in the later sampling round. These chemicals were included in the human health risk assessment (HHRA). The analytical results of the unfiltered (total) and filtered (dissolved) groundwater samples show that concentrations of antimony, arsenic, cadmium, chromium, iron, lead, manganese, selenium, and thallium exceeded the screening criteria and background levels in one or more site wells. All the detected total metals were included for the HHRA, although the site groundwater has high total dissolved solids (TDS), indicative of sea water, which has high salinity and is unsuitable for potable use.

The analytical results of the surface water samples showed that several of the metals were above screening criteria and background levels. Therefore, they were included for the HHRA and an ecological risk assessment (ERA).

Sediment samples collected from the canal connecting the Kiani Lagoon South and Kiani Lagoon North showed that concentrations of several inorganic chemicals and the pesticides DDD, DDE, and DDT exceeded the ecological screening criteria. All the detected chemicals above screening criteria were included in the ERA and HHRA.

In summary, the analytical results indicate that the site has metals and some organic chemicals detected in the soils, groundwater, surface water, and sediments. All the detected chemicals were identified for further evaluation in risk assessments. The potential fate and transport of the detected chemicals above criteria and background are discussed in Section 5 and summarized below.

Contaminant Fate and Transport Summary

The discussion below is a summary of the fate and transport of constituents, primarily those identified as contaminants, based on the sample distribution from the Expanded PA/SI and RI. It is recognized that there is uncertainty associated with constituents identified as

contaminants and their associated concentrations because soil samples were not collected directly through the waste piles. It is possible that additional contaminants or contaminants at higher concentrations would have been identified under those circumstances. However, the general discussion of fate and transport is appropriate based on the data collected. Further, the removal action will address the contamination present in the waste, which will address the uncertainty associated with contaminant types and levels and their associated fate and transport.

A fate and transport evaluation was performed for the potential contaminants at SWMU 6. The primary migration pathways for transport of contaminants from the disposal area are through leaching of contaminants from surface and submerged buried waste into soil and then to groundwater and also through surface runoff into the canal and the ditch. Based on possible migration pathways and chemical characteristics, it appears that a few chemicals may have been released at the site during disposal activities and then transported to subsurface soil, groundwater, surface water, or sediment. Chloroform, Aroclor 1221, Aroclor 1232, and perchlorate have been occasionally and inconsistently detected in groundwater. The source of these chemicals may not be site-related. Since bis(2-ethylhexyl)phthalate is a common laboratory and field contaminant, its source in site media is questionable.

Metals are common at the site in all environmental media. Eight metals (arsenic, antimony, cadmium, copper, iron, lead, thallium, and zinc) were detected above their respective background levels in surface or subsurface soils; all other inorganic chemicals in surface and subsurface soils were below their respective background concentrations. Most inorganic chemicals at the site appear to be from background occurrence. The fate and transport of metals is difficult to predict. The persistence and mobility of metals depends on several factors, including oxidation reduction potential (ORP), pH, metal complex formation, valence state of the metal, the clay, organic matter, and iron and manganese oxides. The shallow aquifer at the site appears to be under reducing conditions, with data indicating that manganese, iron, and sulfate reduction may be occurring within the aquifer. Most metals detected in surface water are primarily sorbed to particulate and organic matter, making their bioavailability lower than in their dissolved forms. It is also possible that observed metals in groundwater at the site could be due to geochemical processes occurring in the site subsurface environment.

An HHRA and ERA were conducted for all chemicals detected above screening criteria.

Human Health Risk Assessment Summary

The discussion below is a summary of the human health risk assessment conducted for SWMU 6, based on the data from the sample distribution discussed previously. It should be noted that the assessment of risk does not account for soil constituent concentrations within and beneath the waste piles, so there is uncertainty associated with the constituents of potential concern (COPCs) identified and the risk assessment conclusions drawn based on those COPCs. However, this is an uncertainty that will be addressed via the removal action and its associated waste characterization and confirmatory sampling protocol.

The site exposure media evaluated were surface soil, subsurface soil, sediment, surface water, and groundwater. All the detected chemicals in the Expanded PA/SI and the RI were included for COPC selection. The maximum detected chemical concentration was compared

against the screening criteria in the EPA Risk Assessment Guidance for Superfund (RAGS) Part D tables presented in Appendix L of this RI report.

The chemicals identified as COPCs were inorganic chemicals and SVOCs (poly-aromatic hydrocarbons(PAHs)) in soils, chloroform, historical detection of PCBs and inorganic chemicals in groundwater, one SVOC and metals in sediments, and inorganic chemicals in surface water.

The DOI conducted a limited investigation of biota chemical concentrations by sampling two land crabs and one composite sample of fiddler crabs. The land crab tissue indicated the presence of three metals, and one of the two land crab samples had two organochlorine pesticides. The purpose of the sampling was to assess the potential impacts of the waste disposal to the area's ecological receptors; therefore, only total body chemical levels were measured during the DOI sampling from these crabs. Thus, it may not be appropriate to include these results for health impacts that could be from edible tissue consumption, whereas the DOI samples represent whole body concentrations. As a conservative evaluation, a comparison was made to the calculated PRGs (see Appendix I). The metals did not exceed the calculated PRGs, and meal limitation would be indicated for the crabs due to the presence of pesticides. However, the site is not likely to support unlimited ingestion due to the small area with a limited occurrence of crabs within the site. These pesticides are commonly found in the general area possibly due to past uses of these chemicals such as agricultural pest control uses or facility maintenance type of activities during past Navy operations.

The HHRA evaluated the exposure of potential receptor populations to site media including maintenance workers, industrial workers, construction workers, recreational receptors, and residential receptors. The estimated cancer risks from soils were within target limits for all the receptors. The hazard index (HI) for soils was above target limits for the residential child due to the presence of iron and vanadium in soils. Also, the residential adult cancer risks (1.1E-03) and HI (7.0) from groundwater exposure through potable use were above target limits due to the arsenic level. The carcinogenic risk and HI were above target limits for a residential child as well, due to arsenic in groundwater. The groundwater HI is well above the target value of 1.0 due to the presence of the antimony, arsenic, cadmium, iron, manganese, selenium and thallium. However, the high total dissolved solids levels are indicative that site groundwater is similar to sea water and is not fit for potable use. The metals detected in the site wells appear to be either associated with the suspended solids in water samples or due to geochemical processes that increase dissolved concentrations of some of the major cations such as iron and manganese. The high TDS levels in groundwater in this area would preclude its use as a drinking water supply, and thus consumption of this groundwater is not likely. Puerto Rico regulations require that groundwater with TDS less than 10,000 mg/L be considered potable. All of the groundwater samples collected at SWMU 6 had chloride concentrations greater than 27,000 mg/L.

Perchlorate was detected in one of the wells, and resampling did not confirm its presence. The detection of perchlorate is likely a false positive value (DoD, 2002), and thus perchlorate is likely not present at the site. Historically (i.e., prior to 2004), perchlorate was most commonly analyzed using EPA analytical method 314.0. This method is recommended for drinking water analysis, but by 2004 had become recognized by EPA and DoD as potentially unreliable (e.g., potentially yielding false positives) for other matrices, such as soil and

groundwater, especially at low concentrations. In June 2000, four SWMU 6 groundwater samples and one duplicate were analyzed for perchlorate by EPA Method 314.0. Perchlorate was not detected; however, the reporting limit was 40 ug/l. In September 2003, nine SWMU 6 groundwater samples and one duplicate were analyzed for perchlorate using a reporting limit of 20 ug/l. Perchlorate was reported at 12.8 ug/l in the sample collected from MW01. Based on the DoD recommendation to confirm detections of perchlorate by an alternative analytical method (DoD, 2004), two groundwater samples and two duplicates from MW01 were collected in February 2004 for simultaneous analysis by 314.0 and SW846 Method 8321A. The reporting limit for the 8321A method was 2 ug/l, an order of magnitude lower than the 314.0 method as a result of more sensitive instrumentation. Perchlorate was not detected in any of the four samples. Therefore, MW01 has been sampled multiple times for perchlorate, which was detected in only one of the samples using the method suspected of producing false positives. Confirmation sampling by both the same method and also the more sensitive method demonstrates that the single detect is likely to be a false positive result.

The organic chemicals in site soils, groundwater, sediment, and surface water do not likely present significant risks or hazards, but it is recognized that this conclusion with respect to soil is uncertain because soil samples were collected adjacent to the waste piles, rather than directly within/beneath them. All the other chemicals are inorganic. As explained above, none of the inorganic chemicals likely presents a human exposure-related health risk that is specific to previous SWMU 6 operations, but it is recognized that this conclusion with respect to soil is uncertain because soil samples were collected adjacent to the waste piles, rather than directly within/beneath them. The site groundwater is not potable due to high salinity, and exposure assumptions used in the risk assessment are likely to be overly conservative. Due to the likely absence of site-specific risks above background levels, the site would not be proposed for further investigation or implementation of remedial action on the basis of the risk assessments. However, because there is uncertainty associated with the risk conclusions and the debris being a potential future source of contamination, the agencies have concurred that in order to address the uncertainty and ensure the residual media concentrations at the site are protective of human health, a removal action will be performed.

Ecological Risk Assessment

The discussion below is a summary of the ecological risk assessment conducted for SWMU 6, based on the data from the sample distribution discussed previously. It should be noted that the assessment of risk does not account for potentially higher soil constituent concentrations within and beneath the waste piles, so there is uncertainty associated with the COPCs identified and the risk assessment conclusions drawn based on those COPCs. However, this is an uncertainty that will be addressed via the removal action and its associated waste characterization and confirmatory sampling protocol.

The ERA for SWMU 6 was conducted in accordance with the *Navy Policy for Conducting Ecological Risk Assessments* (CNO, 1999) and the EPA Ecological Risk Assessment Guidance for Superfund (EPA, 1997). SWMU 6 has been relatively undisturbed since the late 1970s, and the site vegetation now consists of extensive black and red mangrove communities. SWMU 6 is adjacent to Kiani Lagoon to the south. A canal that opens to Vieques Passage is just west of

the site and connects to Kiani Lagoon. The site is a thriving habitat for plant, invertebrate, bird, and mammal communities. The adjacent aquatic saltwater habitat associated with the Kiani Lagoon system is supportive of fish, invertebrate (e.g., hermit and land crabs), aquatic plant (mangroves), and semi-aquatic bird communities. A chain link fence extends along the south side of the site, along Highway 200, that prevents human access but would not limit wildlife access; other sides of the site offer points of unrestricted access.

The exposures to surface soil, sediments, and surface water were evaluated for organic and inorganic chemicals through screening-level risk assessment and a baseline risk assessment. A bioaccumulation potential in the higher trophic level organisms was evaluated using the food web exposure model. The food web model used very conservative assumptions for high-toxicity chemicals, in which these chemicals were evaluated for potential risks using half the detection limit values, even when they were not detected in any of the site media.

The baseline risk assessment (Step 3) concluded that the chemicals preliminarily identified as COPCs in the screening-level risk assessment (Step 2) were not considered as final COCs following the Step 3A refinement, but it is recognized that this conclusion with respect to soil is uncertain because soil samples were collected adjacent to the waste piles, rather than directly within/beneath them.

The memorandum prepared for the preliminary study conducted by the DOI that included three samples, two land crabs and one composite sample of fiddler crabs, was reviewed for its applicability to the ecological risk evaluations. A summary of the review is included in Appendix L. The chemical concentrations detected by the DOI in the crab tissues are not at levels that would pose an unacceptable risk to birds foraging at the site. Chemicals of potential concern in crab tissues identified by the DOI included DDE, DDT, cadmium, lead, and vanadium. A conservative back-calculation using the food web model from the SWMU 6 ERA (as presented in Appendix L) was used to conservatively estimate the highest concentrations of these chemicals in crab tissue that would pose no adverse effects to three species of wading birds, the great blue heron, yellow-crowned heron, and green heron. A key assumption of the model was that the diets of these birds consisted entirely of crabs (i.e., no fish).

The food web model results indicated that for both DDE and DDT, no adverse effects would occur to these bird species consuming crabs with tissue concentrations at or below 1.03 mg/kg dry weight (wt). The maximum DDE and DDT concentrations measured by the DOI in crabs were less, equaling 0.52 and 0.11 mg/kg, respectively. For cadmium, lead, and vanadium, the model indicated that no adverse effects would occur at the respective crab tissue concentrations of 5.0, 13.3, and 39.5 mg/kg dry wt. The maximum concentrations measured in crabs by the DOI were less than these values (cadmium = 1.6 mg/kg dry wt; lead = 11.7 mg/kg dry wt; vanadium = 2.63 mg/kg dry wt).

Therefore, despite the technical issues and uncertainties with the crab tissue samples, concentrations detected in the crab tissues are not likely at levels that would pose an unacceptable risk to birds foraging at the site.

The overall ERA conclusion is that although many metals and some organic chemicals were identified as COPCs, risks to lower trophic level receptors were negligible based on the low magnitude of screening value exceedances and comparisons to background/upgradient

data. There were also no significant risks identified for terrestrial wildlife. As with the human health risk assessment conclusions, because the uncertainty associated with the ecological risk conclusions made in the draft report, the agencies have concurred that in order to address the uncertainty and ensure the residual media concentrations at the site are protective of the environment, a removal action will be performed.

Conclusions and Recommendations

The waste present at SWMU 6 is significantly degraded, and most remnants of the items are small metallic and glass pieces. The site is located adjacent to Highway 200, which is an access road for the public using beaches farther west in this part of the island; thus, the site is easily seen from the road. A fence separates the site from Highway 200, limiting the access. While the physical appearance of the waste items may diminish the aesthetic appeal of the site, the waste may not present chemical hazards defined under CERCLA regulations. There is uncertainty associated with this conclusion because samples were not collected within the waste piles due to safety concerns. Therefore, based on the results of the RI and the anticipated land use of the site, the site conditions at SWMU 6 do not likely pose an unacceptable risk to human health or ecological receptors, and no further investigations or actions would be recommended based on the results of the risk assessments. However, because there is uncertainty associated with the risk conclusions and the debris being a potential future source of contamination, the agencies have concurred that in order to address the uncertainty and ensure the residual media concentrations at the site are protective of human health and the environment, a removal action will be performed.

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List of Acronyms

AB	Ambient Blank
amsl	above mean sea level
BCF	Bioconcentration Factor
BEHP	bis(2-ethylhexyl) phthalate
BERA	Baseline Ecological Risk Assessment
bls	below land surface
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CLEAN	Comprehensive Long-Term Environmental Action Navy
COPCs	Constituents of Potential Concern
CS	Confirmation Study
CSM	Conceptual Site Model
DAF	Dilution Attenuation Factor
DGP	Differential Global Positioning System
DoD	Department of Defense
DOI	Department of Interior
DQE	Data Quality Evaluation
EBS	Environmental Baseline Survey
EDS	Environmental Data Services, Inc.
EM	electromagnetic
EOD	Navy Explosive Ordnance Disposal
ERA	Ecological Risk Assessment
ERB	Equipment Rinsate Blank
ERL	Effects Range-Low
FB	Field Blank
FS	Feasibility Study
ft	feet
gpm	gallon per minute
GPS	Global Positioning System
HHRA	Human Health Risk Assessment
HI	Hazard Index
IAS	Initial Assessment Study
LANTDIV	Atlantic Division
LCS	Laboratory Control Standard

LOECs	Lowest Observed Effect Concentrations
MB	Method Blank
MCLs	Maximum Contaminant Levels
MDL	Method Detection Limit
MEC	Munitions and Explosives of Concern
mg/kg	Milligrams per kilogram
mL/g	Milliliters per gram
MOV	Municipality of Vieques
MS/MSD	Matrix spike/matrix spike duplicate
msl	mean sea level
mV	millivolts
NASD	Naval Ammunition Support Detachment
NAVFACENGCOM	Naval Facilities Engineering Command
NFG	National Functional Guidelines
NOAA	National Oceanic and Atmospheric Administration
NOEC	No Observed Effect Concentration
NPL	National Priorities List
NRHP	National Registry of Historic Places
OE	Ordnance and Explosives
ORP	Oxidative-Redox Potential
OVM	Organic Vapor Meter
PA/SI	Preliminary Assessment/Site Investigation
PARCCs	Precision, accuracy, representativeness, completeness, and comparability
PCBs	Polychlorinated biphenyls
PCE	Tetrachloroethene
PID	Photoionization detector
ppm	Part per million
PQL	Practical quantitation limit
PREQB	Puerto Rico Environmental Quality Board
PRGs	Preliminary Remediation Goals
PVC	Polyvinyl chloride
QC	Quality Control
RA	Risk Assessment
RAGS	Risk Assessment Guidance for Superfund
RBC	Risk-based concentration
RI	Remedial Investigation
RL	Reporting Limit
SC	Site Characterization
SDG	Sample delivery group
SERA	Screening ecological risk assessment

SOP	Standard operating procedure
SQAG S	Sediment Quality Assessment Guidance
SSL	Soil Screening Level
SVOC	Semi-Volatile Organic Compound
SWMU	Solid Waste Management Unit
TB	Trip Blank
TDS	Total Dissolved Solids
TOC	Top of casing
TTAL	Treatment technique action level
USEPA	United States Environmental Protection Agency
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
UTL	Upper tolerance limit
UXO	Unexploded ordnance
VOCs	Volatile organic compounds
wt	weight
µg/Kg	micrograms per Kilogram
µg/L	micrograms per Liter

SECTION 1

Introduction

This Remedial Investigation RI report presents the results of the RI completed at SWMU 6, Mangrove Disposal Site of the former NASD, Vieques, during 2003. This RI report incorporates previous investigations conducted at SWMU 6. Based on the RI, results of the risk assessment (RA) were used to determine whether a feasibility study (FS) would be needed that would present a range of remedial action alternatives to protect human health and the environment. The results of the RI provide a comprehensive understanding of environmental contamination at the site and recommendations for moving forward in the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) process at the site.

In April 2004, the Draft RI Report for SWMU 6 was submitted for regulatory agency review. Soil samples were collected primarily adjacent to waste piles rather than directly through the waste piles (due to safety concerns), and the conclusions drawn based on those data were that the site does not pose an unacceptable risk to human health or the environment. While uncertainty is inherent (and at some level, acceptable) in all findings, conclusions, and decisions made in the environmental investigation and remediation process, the Navy and regulatory agencies have concurred that the uncertainty associated with the waste representing a potential future source of contamination (and associated potential risks) is unacceptable.

In 2005, the Navy, United States Environmental Protection Agency Region II (USEPA), and the Puerto Rico Environmental Quality Board (PREQB) concurred that a waste removal action, coupled with a robust waste characterization and confirmatory sampling protocol, will address the uncertainties associated with the findings and conclusions of the RI Report and ensure residual media concentrations are protective of human health and the environment. Prior to the removal action, soil samples will be collected across the disposal area (including within the waste piles) to determine the appropriate disposal alternative(s).

Following the removal action, confirmatory samples will be collected from the excavated area and a risk assessment will be performed to ensure residual media concentrations are protective of human health and the environment. The risk assessment will take into consideration the information presented in the Comprehensive Conservation Plan provided by the Department of Interior (DOI). Additionally, the risk assessment will be performed in accordance with the human health and ecological risk assessment protocols in the Master Quality Assurance Project Plan (CH2M HILL, May 2006), refined as applicable in accordance with regulatory agency comments.

In order to efficiently focus resources to achieve timely removal of the waste at SWMU 6 and confirm residual media concentrations are protective of human health and the environment, this report has been finalized as originally presented in draft form with the following modifications:

- All agency comments are presented in Appendix M

- Because the risk assessments for SWMU 6 are going to be redone using the confirmatory data collected as part of the removal action, the human health and ecological risk assessments have been relocated to Appendix L to help emphasize that they will be obsolete following the removal action and the fact that their findings are not the basis for conducting the removal action (i.e., removal is being conducted to address uncertainty of debris being a potential future source of contamination).
- Rather than address individual agency comments, the substantial comment themes (e.g., uncertainties associated with sample locations, conclusions regarding potential risk, etc.), are acknowledged by text insertions (and some text deletions) throughout the document to show that the findings/conclusions drawn by the Navy in the draft report are not necessarily concurred upon by the regulatory agencies, but that the uncertainties associated with the waste piles will be addressed by the removal action.

This report has been prepared for the Commander of the U.S. Navy's Atlantic Fleet by the Naval Facilities Engineering Command (NAVFACENGCOM) Atlantic Division (LANTDIV) and CH2M HILL under Navy Contract N62470-02-D-3052, Navy Comprehensive Long-Term Environmental Action Navy (CLEAN), District III, Contract Task Order 007.

1.1 Purpose and Scope

This RI was designed to accumulate sufficient site data so that the nature and extent of contamination at the site could be characterized and so that recommendations for remedial actions, if any, could be evaluated from site data. To achieve this, the following two primary objectives were developed:

1. Complete a field data collection and analysis program to evaluate the type, extent, and magnitude of contamination present in site media (soils, groundwater, surface water, and sediments).
2. Determine the current and potential future risks to human health and the environment from existing site media contamination based results of the RI and the anticipated future land use of the site.

To meet these objectives, various field-specific tasks were implemented at the site to help form conclusions on the potential site risks posed by contamination. These tasks included:

- Examination of previous environmental investigations and activities at SWMU 6 to evaluate and establish a baseline of the site's physical characteristics, subsurface soil profiles, groundwater interfaces, and soil and groundwater quality.
- Performance of geophysical surveys to delineate the extent of waste disposed of at the site and to confirm that no MEC are present at sampling locations.
- Collection and interpretation of groundwater level data at SWMU 6 and the nearby tidal canal and lagoons to establish baseline dynamic groundwater levels and tidal effects on them.
- Installation of four new permanent monitoring wells to supplement the four existing monitoring wells constructed during the site characterization (SC) and Expanded PA/SI.

- Collection of eight groundwater samples from existing and newly installed monitoring wells for laboratory analysis and reporting.
- Collection of 15 surface soil samples to determine whether soil contamination extended horizontally in the source area.
- Collection of 9 surface water and 14 sediment samples for laboratory analysis and reporting to supplement data from the SC and PA/SI.
- Collection of site-specific background samples of groundwater, sediment, and surface water for comparison with concentrations of inorganic chemicals detected in these media at SWMU 6.
- Collection of quality control (QC) samples for each of the environmental media sampled at the site, along with the collection of background samples.
- Completion of laboratory analysis of the collected soil, groundwater, sediment, and surface water samples for metals, volatile organic compounds (VOCs), semivolatile organic compounds (SVOCs), pesticides, polychlorinated biphenyls (PCBs), and explosives.

The scope for the RI field program was completed in accordance with the provisions of CERCLA and followed the Environmental Protection Agency (EPA) interim final *Guidance for Conducting Remedial Investigations and Feasibility Studies under CERCLA* (EPA, 1988).

As indicated above, the main objective of the SWMU 6 RI was to collect sufficient data to make remedial action recommendations for the site. Because the Navy and regulatory agencies have concurred that a removal action will be conducted, the objective of investigation has been met even though there is uncertainty associated with the findings, conclusions, and recommendations of this report. The removal action will remove debris and contaminated soil posing an unacceptable risk to human health and the environment. Pre-removal waste profiling sampling will be conducted to determine the appropriate disposal alternative(s) for the debris and soil. Confirmatory sampling and a residual risk assessment will be conducted following the removal action to ensure residual media concentrations are protective of human health and the environment.

1.2 Report Organization

This report contains 7 sections, presented in Volume I, and 13 appendixes, presented in Volume II. The sections in Volume I are organized as follows:

Section 1. Introduction presents a summary of the objectives of the investigation and the organization of this report**.**

Section 2. Physical Setting, Site History, and Previous Investigations presents general background on SWMU 6 including its history and physical setting, a summary of natural and cultural resources, and a discussion on the regulatory status of the site.

Section 3. Summary of Field Investigation provides site-specific descriptions and summaries of the various tasks completed as part of the RI for SWMU 6 and the approach, methods, and operational procedures employed to perform these tasks. This section also

presents the data management and quality control measures used during collection of site data and a data quality evaluation (DQE) of analyzed data.

Section 4. Nature and Extent of Contamination presents the results of investigation of the nature and extent of contamination at SWMU 6 in soil, groundwater, surface water, and sediment.

Section 5. Contaminant Fate and Transport builds on results of the previous sections and uses information on site physical characteristics, contaminant source characteristics, and extent of contamination to formulate conclusions on contaminant fate and transport. This section also introduces the conceptual model (CSM) for the main operational area of the former NASD and for SWMU 6. The CSM illustrates the primary contaminant sources, release mechanisms, pathways, and potential receptors.

Section 6. Remedial Investigation Conclusions and Recommendations presents conclusions and recommendations from the RI program at the site.

Section 7. References presents a list of other documents and sources cited or used in developing this RI report.

A human health risk assessment (ERA) and a screening ecological risk assessment (SERA), constituting Steps 1 and 2 of the ecological risk assessment (ERA) process and the first step (Step 3) of a baseline ecological risk assessment (BERA), were conducted for SWMU 6, as proposed in the work plan (CH2M HILL, 2003). These risk assessments are presented in Appendix L. It is important to emphasize that the risk assessment conclusions are based on the data discussed in Section 4. There is recognized uncertainty associated with the number, type, and concentrations of soil contaminants at the site because soil samples were generally collected adjacent to the waste piles, rather than directly through them, due to safety concerns. This may have resulted in an underestimation of the soil contaminant levels and, therefore, the potential risks posed by the contamination. While the results of the HHRA and ERA summarized in Appendix L are appropriate for the data collected, the level of uncertainty associated with the HHRA and ERA conclusions as they relate to the site as a whole (i.e., including the waste piles themselves) warrants action to address the uncertainty. It is the planned removal action, and its associated waste characterization and confirmatory sampling protocol, that will appropriately address this uncertainty. Additionally, the removal action will address the waste as a potential future source of contamination.

It is also important to note that since the HHRA and ERA were performed for the draft report, some information utilized in the risk assessments may have changed, and more will change as a result of the planned removal action. For example, published toxicity values and other health-based criteria for various chemicals have been modified. Another example is that specifics about the future land use have become known. In late 2006, the DOI issued the Draft Comprehensive Conservation Plan for Vieques, which provides details of planned land uses. In order to efficiently focus resources to achieve timely removal of the waste at SWMU 6 and confirm residual media concentrations are protective of human health and the environment, the HHRA and ERA in this report has been finalized as originally presented in draft form, rather than modified with the updated information, because new site data will be collected as part of the removal action and a new risk assessments performed. These new risk assessments will incorporate new information about future land uses and the most up-

to-date risk criteria. Further, the new risk assessments will be performed in accordance with the HHRA and ERA protocols in the Master Quality Assurance Project Plan (CH2M HILL, May 2006), refined as applicable in accordance with regulatory agency comments. Therefore, the HHRA and ERA presented in this RI Report were moved to Appendix L because they will not be representative of the site as a whole once the removal action takes place and, hence, will be re-performed.

SECTION 2

Physical Setting, Site History, and Previous Investigations

This section presents the site setting, history, and previous environmental investigations conducted at SWMU 6. This section also contains brief descriptions of the natural and cultural resources in the former NASD and a discussion of the regulatory status.

2.1 Location

Figure 2-1 illustrates the location of Vieques Island, Puerto Rico, in the Caribbean Sea approximately 7 miles southeast across Vieques Passage from the eastern tip of the main island of Puerto Rico. Vieques is the second-largest island in the Commonwealth of Puerto Rico. It is approximately 20 miles long and 3 miles wide, with an area of 33,088 acres, or 51 square miles.

The SWMU 6 area is located approximately 100 feet south of Vieques Passage at coordinates 18° 07′ 03″N latitude and 65° 33′ 40″W longitude. The site ranges from sea level to 1 foot above mean sea level (msl) and is accessed by Highway 200, which extends east-west through the site. The site is located in a mangrove swamp between two tidally influenced lagoons referred to as Kiani Lagoon North and Kiani Lagoon South. Figure 2-2 shows the location of SWMU 6 within the former NASD property. SWMU 6 is on the area transferred to DOI and is planned for use as a resource conservation area as shown on Figure 6-1.

2.2 Site History

SWMU 6 was used for disposal of solid waste during the 1960s and 1970s for the Navy operations within the former NASD. Waste materials extend approximately 100 feet to 120 feet north-northeast of Highway 200 from the east side of the Laguna Kiani Bridge. An Initial Assessment Study (IAS) team had estimated that this site contains approximately 800 cubic yards of material. Waste discarded at the site includes empty containers of lubricants, oil, solvents, and paints, broken glass, and rubble (EBS, 2000). A CH2M HILL inspection team in conjunction with an MEC avoidance team (CH2M HILL, 2000d) also identified ordnance items and solid waste from the base galley such as pieces of broken glass and china (Appendix A). A geophysical survey was conducted across the area during the Expanded PA/SI (CH2M HILL, 2000d) to determine the extent of buried wastes at this site. No UXO or ordnance and explosives (OE) items were found in either survey at SWMU 6. However, munitions-related materials have been identified such as inert concrete-filled practice bombs, empty bomb dispensers, and empty shell casings.

The U.S. Navy ceased facility-wide operations on the former NASD on April 30, 2001, when the land was transferred to the Department of the Interior (DOI), the Municipality of Vieques (MOV), and Conservation Trust. SWMU 6 is located on DOI property that has been

designated as a wildlife refuge. Figure 2-3 is an aerial photograph of SWMU 6 that shows the dense vegetation in the mangrove area and the access restriction boundary around SWMU 6.

2.3 Physical Setting

2.3.1 Weather and Climate

The climate of Vieques is tropical-marine. Temperatures are nearly constant, with an annual average of about 79°F; August is the warmest month at 82°F and February the coolest at 76°F (Greenleaf/Telesca, 1984). Vieques lies directly in the path of the prevailing easterly trade winds that regulate the climate of Puerto Rico. The trade winds result in a rainfall pattern characterized by a dry season from December through July and a rainy season from August to November. Heavy precipitation may be induced by tropical storms from June to November, which is considered normal for this area of the Caribbean. The western part of the island, where the site is located, averages approximately 50 inches of rainfall per year, 50 percent of which occurs during the rainy season (U.S. Geological Survey [USGS], 1989).

2.3.2 Topography

The topography of the former NASD is characterized by a series of low hills and small valleys intersected by drainage ditches. The most elevated areas occur along a west-to-east axis near the center of the former NASD. The highest point is Mount Pirata, approximately 987 feet above sea level. In general, the slope of the former NASD tapers gradually down from the center to the coastal areas, with the exception of steep slopes in the vicinity of Mount Pirata.

The topography at SWMU 6 is characterized by relatively flat, swampy, tidal marsh areas (CH2M HILL, 1999). The Kiani Lagoon surface water to the north and south of the site is directly connected to Vieques Passage. Water from the lagoons rises and falls with the tides and at times covers portions of the site. The site is located at elevations between sea level and 1 foot above msl, as shown in Figure 2-4.

2.3.3 Vegetation

SWMU 6 is dominated by black mangrove and red mangrove communities between Kiani Lagoon and Vieques Passage. The red mangroves are located along the intertidal zone, where there is frequent saturation/inundation of seawater; the black mangroves are located farther inland on higher ground. No endangered or threatened plant species were observed within SWMU 6 during the field survey.

The red mangrove community is sparsely vegetated (approximately 25 percent cover) and has large pools of open water. Most of the red mangroves are a monotypic stand of shrubs with scattered red mangrove seedlings. The black mangrove community also is sparse, with approximately 25 percent of total cover. Plants were predominately short shrubs (8 to 15 feet); however, there were some patches of herbaceous vegetation on higher topography. Other shrub vegetation included white mangrove, mesquite, and sweet acacia. The herbaceous vegetation was dominated by seashore dropseed, salt heliotrope, sea purslane, and bay flower. No stresses were observed in the plant communities.

2.3.4 Geology

2.3.4.1 Regional Geology

The geology of western Vieques, where SWMU 6 is located, is characterized by plutonic rocks generally overlain by alluvial deposits. The plutonic rocks consist of granodiorites that were intruded by a quartz-diorite plutonic complex and the rocks are exposed over a large percentage of the island. A gradual change in texture from coarse- to fine-grained quartz-diorite has been observed from the west to east part of Vieques. A saprolite layer occurs at the surface of the plutonic complex. The alluvial deposits are generally of Quaternary age, consisting of a mixture of sand, silt, and clay that together have an average thickness of 30 feet in western Vieques. The sediments consist of alluvial deposits, beach and dune deposits, and swamp and marsh deposits. The floodplains consist of beach and dune deposits formed by calcite, quartz, plutonic rock fragments, and minor magnetite (USGS, 1989).

2.3.4.2 Local Geology

A geologic cross section for SWMU 6 was developed through the evaluation of soil boring logs and is illustrated as Figures 2-5 and 2-6. Soil samples were collected for classification purposes during the installations of soil borings and monitoring wells associated with the confirmation study completed in 1988 and the expanded PA/SI completed in 2000; these indicate that the soils encountered beneath SWMU 6 consist of a mixture of organic clays and silts mixed with sand and shell fragments. Soil coloration was documented through a comparison to a Munsell® color system, which indicated soil colors ranging from gray to dark greenish gray to dark charcoal gray and black. These sediments are generally under water during periods of rain and exposed when dry.

Geologic logs prepared from soil borings completed during the RI program at SWMU 6 indicate similar subsurface geology as documented in prior investigations at the site, including the CS and expanded PA/SI. Four soil borings were completed to depths ranging from 11 to 15 feet for well installation along with 15 shallower (0.0 to 0.5 foot) soil borings for soil sampling purposes. The site geology mostly consists of a silty sand with organic material from ground surface to a depth of 1 to 7 feet below land surface (bls), underlain by a well-graded sand with crushed shells to a depth of at least 15 feet, which was the maximum depth of the borings. Soil colors ranged from primarily a dark grayish brown in the silty sand to a light bluish gray in the well-graded sand. This silty sand zone and the well-graded sand zone generally possess low plasticity when moist, are loose when dry, and are easily crumbled under hand pressure.

2.3.5 Hydrology

2.3.5.1 Surface Water

Surface water present on the former NASD consists of several lagoons and intermittent streams. The Arenas, El Pobre, and Kiani Lagoons are at the northwestern end of the former NASD, and the Playa Grande Lagoon is at the southeastern end. These lagoons are generally very shallow and characterized by a large concentration of mangroves along the shorelines. Most of the streams on the former NASD are ephemeral, flowing only for a short time after rainstorms. These natural storm drainage channels are found throughout the former NASD,

generally extending in a northerly or southerly direction downward from the central elevated inland areas (Greenleaf/Telesca, 1984).

SWMU 6 is near Kiani Lagoon and adjacent to a canal just west of the site that opens up to the Vieques Passage and connects Kiani Lagoon, El Pobre Lagoon, and the open water. During tidal changes a strong current flows either north or south depending on the stage of the cycle.

2.3.5.2 Groundwater

SWMU 6 is underlain by an unconfined groundwater system composed of alluvial deposits that are made of silty sands and well-graded sands. Groundwater was encountered at the site at depths of approximately 1 to 2 feet bls during monitoring well installation. The site appears to lie within the area of the Resolución Valley aquifer system and has similar sand units to those noted in the USGS (1989) study. Regional groundwater flow is generally to the north in the direction of Vieques Passage. At SWMU 6 the local groundwater flow varies depending on the tidal influence. The groundwater gradient may change direction from north to south or east to west depending on where the tide is. These data are discussed in Section 3. Figure 2-7 illustrates the groundwater flow direction at the site during an ebbing tide approximately four hours before low tide.

2.4 Wildlife

During the wildlife surveys conducted on this site, a few wildlife species including birds and lizards were observed in the habitat. Green heron, bananaquit, white-crowned dove, yellow warbler, common moorhen, pearly eyed thrasher, zenaida dove, and anolis lizards were observed during the survey. The mangrove community also had significant crab activity. The red mangrove community, with more water present, had more crab burrows than the black mangrove community. There was no visual evidence that releases from the site have had an adverse impact on wildlife or habitat.

No endangered or threatened wildlife species were observed during the survey. The federally endangered tree cobana negra is known to occur in coastal forests of southeastern Puerto Rico (Little and Wadsworth, 1964). One of the two known *Stahlia monosperma* populations is located on the eastern boundary of Kiani Lagoon, which is close to SWMU 6. No cobana negra individuals were found at SWMU 6. Although this tree species has been found in Kiani Lagoon, the habitat of SWMU 6 is a mixed mangrove community, which is not preferred habitat of cobana negra.

Brown pelicans and roseate terns, both federally endangered marine birds, were not observed during the field survey within SWMU 6 but have been known to occur at Kiani Lagoon. During the surveys, brown pelicans were observed flying over the adjacent marine habitat but were not observed using SWMU 6.

2.5 Cultural Resources

A number of resources on the former NASD property are of interest from a cultural perspective, including conservation zones, cultural resources, and prehistoric and historic sites. U.S. Navy surveys have located more than 100 sites on Vieques with the potential to contain significant cultural resources. Eleven of these sites are listed in the National Registry of Historic Places (NRHP).

The sugarcane industry was the major economic base of Vieques during the late 19th century and early 20th century. Several sugarcane factories operated at or near the former NASD property, including the Arcadia, Playa Grande, Resolución, and Santa Elena factories. Sugarcane operations in Vieques were largely discontinued in the early 1940s when the U.S. Navy purchased large portions of the island; operations were discontinued entirely by the early 1950s.

A total of 17 archeological sites and districts are listed on the NRHP for Vieques, with 12 of these on the western end of the island (Geo-Marine, 1996). This information has been confirmed in the review of other cultural resource maps of Vieques. None of these 12 archeological sites occurs within the SWMU 6 area. No cultural resources are expected to be encountered at SWMU 6 based on its history and lack of documented evidence of such resources.

2.6 Previous Investigations

Several investigations have been conducted onsite to evaluate the presence of contaminants from the historical disposal operations in the 1960s through the late 1970s. These investigations included analyses of soil, groundwater, surface water, and sediments and ecological surveys of the habitats and wildlife occurrences. Table 2-1 summarizes the previous investigations and the findings.

2.6.1 Confirmation Study

A confirmation study (CS) was conducted at SWMU 6 in 1988 to evaluate potential contamination from the historical Navy disposal activities (ESE, 1988). Five surface water, five sediment, and eight soil samples were collected and analyzed for pH, chromium (total and hexavalent), lead, volatile organic compounds (VOCs), xylene, methyl ethyl ketone, and methyl isobutyl ketone. No groundwater samples were collected during the CS activities at this site. The analytical results indicated that lead and chromium were present in surface water above detection limits, but they were below ambient water quality and drinking water criteria. In soil, the concentrations of total chromium ranged from 18.5 to 48.2 milligrams per kilogram (mg/kg), and lead concentrations ranged from 10.2 to 345 mg/kg. In sediment, total chromium concentrations ranged from 5.28 to 88.4 mg/kg. The concentration of lead found in the sediment ranged from 2.82 to 312 mg/kg. The CS Report stated that no elevated levels of the constituents of concern were detected in the soil, surface water, or sediment samples collected at SWMU 6. Therefore, no further investigation of the site was recommended.

2.6.2 Expanded PA/SI

In April and May 2000, CH2M HILL conducted an Expanded PA/SI investigation. The study included geophysical surveys, an MEC avoidance survey, installation and sampling of four monitoring wells, and collection of seven surface water, seven sediment, eight surface soil, and four subsurface soil samples. All samples were analyzed for metals, VOCs, semivolatile organic compounds (SVOCs), pesticides, PCBs, and explosives. The soil, surface water, and sediment samples were collected at similar locations to those identified in the CS (ESE, 1986).

Groundwater analytical results from unfiltered (total metals) samples indicated detections of aluminum, antimony, arsenic, barium, cadmium, iron, lead, and manganese at concentrations exceeding the maximum contaminant levels (MCLs) and/or tap water risk-based concentrations (RBCs). Filtered metals (dissolved) results show detections of barium, cadmium, and manganese above the MCLs and/or tap water RBCs. Since the upgradient and downgradient concentrations of these target compounds were similar, the analysis indicated that these levels are likely to be the result of background conditions and not likely to be site-related. Additional compounds detected above the PRGs included PCBs Aroclor 1221 and Aroclor 1232. The well (ND06MW04) that contained low level PCBs was resampled, and PCBs were below detection limits (see Appendix I).

Surface soil samples contained above-criteria quantities of aluminum, antimony, arsenic, chromium, copper, iron, lead, manganese, thallium, and vanadium. SVOCs found were anthracene, benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, dibenzo(a,h)anthracene, fluoranthene, naphthalene, phenanthrene, and pyrene above the human health, leachability, and/or ecological screening criteria. The metals detected in all surface soil samples were at relatively similar concentrations, indicating they could be the result of background conditions and not site-related.

In subsurface soil samples collected, arsenic was detected above the leachability criterion though within the range of soil background levels. All VOCs, SVOCs, pesticides, PCBs, and explosives either were not detected or were detected below their applicable screening criteria.

The surface water samples collected showed some levels of arsenic, copper, lead, mercury, and silver at concentrations exceeding the human health, acute ecological, and chronic ecological screening criteria. All VOCs, SVOCs, pesticides, PCBs, and explosives were either not detected or were detected below their applicable screening criteria.

Sediment samples analyzed detected arsenic, chromium, lead, nickel, and zinc in a single sediment sample at concentrations exceeding the Sediment Quality Assessment Guidance (SQAG) and/or National Oceanic and Atmospheric Administration (NOAA) criteria. Copper was detected in all sediment samples below background criteria. All VOCs, SVOCs, pesticides, PCBs, and explosives were either not detected or were detected below their applicable screening criteria.

2.6.3 Geophysical Survey

A magnetometer survey was conducted to help delineate potential areas of buried metallic waste. From the survey, most ferrous metal debris appeared to be present in the northern

portion of the site and under the road of the survey area. The Expanded PA/SI report includes an appendix giving details of the geophysical survey report for this site (CH2M HILL, 2000).

2.6.4 MEC Avoidance

MEC technicians did not find any active items at this site during visual site inspection or a magnetometer-aided survey at the sampling locations. Navy Explosive Ordnance Disposal (EOD) technicians examined two bomb dispensers at SWMU 6 and confirmed that they were empty and posed no hazard. Inert items such as concrete-filled practice bombs and empty shell casings have been documented at the site.

2.6.5 Crab Study

A crab study was conducted by the DOI Fish and Wildlife Service in 2002 (DOI, 2002) to evaluate the levels in fiddler crab and land crab tissue of pesticides and heavy metals. According to the study, DDT, DDE, lead, vanadium, and cadmium were detected within the sample tissue analyzed.

2.7 Regulatory Status

The investigations of these sites are being conducted in accordance with the CERCLA process. The PA/SI and RI were conducted with the PREQB as the lead regulatory agency, since SWMU 6 was a non-National Priorities List (NPL) site. However, in March 2005, Vieques was placed on the NPL, with USEPA as the lead regulatory agency.

SWMU 6 was originally identified as a potential release location and addressed under the CS investigation in 1988 and investigated in the Expanded PA/SI (CH2M HILL, 2000d). EPA Region 2 has reviewed the CS and the Expanded PA/SI reports and has provided comments on both reports. These comments were incorporated in the work plan and included recommendations for additional sampling of soils, groundwater, surface water, and sediments. Regulatory comments regarding collecting soil samples through the debris piles were not incorporated due to potential safety concerns. However, soil samples were collected in locations immediately adjacent to waste piles.

Based on EPA and PREQB comments, analytical results from the previous investigations indicated a need for further investigation at SWMU 6. Additional data were collected during 2003 as part of this RI to further characterize the sites and define the nature and extent of contamination in site media. The details of the RI investigation are discussed in Section 3.

TABLE 2-1
Previously Conducted Sampling At SWMU 6
SWMU 6, Former NASD, Vieques, Puerto Rico

Event/Activity	Samples	Purpose	Findings
Confirmation Study (1988)	8 soil 5 surface water 5 sediment	Determine if hazardous chemicals are present	No organic contamination. Two metals were detected.
Expanded PA/SI (2000) included following investigations			
Ecological Survey	Plant and animal survey	Characterize ecology, identify threatened and endangered species, qualitative impact analysis	No threatened or endangered species identified, no impacts
Geophysical Survey	NA	Define extent of waste	3 distinct areas were identified with buried waste
MEC Avoidance Survey	NA	Determine presence of any MEC items	No live OE items were identified within SMWU 6. Inert OE items were found such as inert concrete filled practice bombs, empty bomb dispensers, and empty shell casings.
PA/SI Sampling	4 wells 8 surface soil 8 subsurface soil 7 surface water 7 sediment	Determine if RI/FS is required or NFA	Metals in groundwater, surface water, and sediment were above criteria PAHs and/or metals in surface and subsurface soils were above criteria A single detection of PCBs was above criteria in groundwater
Field Screening for VOCs	13 OVM readings (3-4 from each well boring)	Determine if soils above the groundwater had any VOCs	No VOCs were detected

Anegada

British Virgin Islands

U.S. Virgin Islands

Virgin Gorda

Tortola

San Juan

Culebra

U.S. Naval Activity Puerto Rico

St. Thomas

St. John

PUERTO RICO

VIEQUES

West Vieques
(Former NASD)

East Vieques
(Former VNTR)

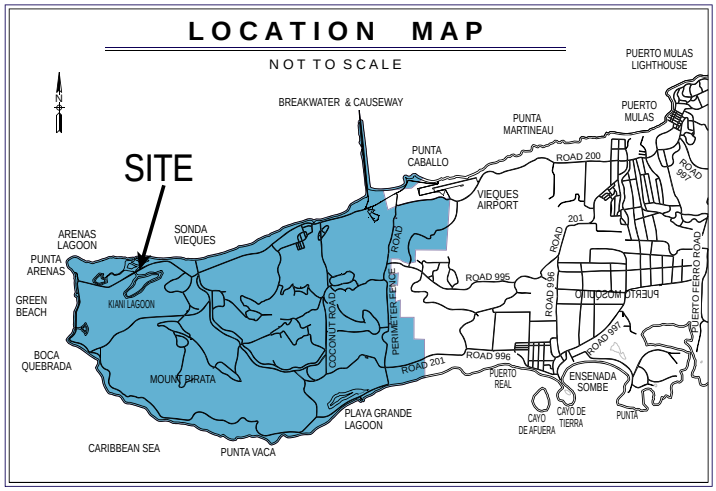
St. Croix

N

Scale in Miles

0 15

FIGURE 2-1
Regional Location Map
SWMU 6, Former NASD, Vieques, Puerto Rico



LEGEND

- PROPERTY LINE
- EASEMENT LINE
- APPROXIMATE EDGE OF WATER
- UNITED STATES GOVERNMENT\ DEPARTMENT OF THE INTERIOR
- PUERTO RICO CONSERVATION TRUST
- AREA OF RESTRICTED LAND USE AT SWMUs AND AOCs

SOURCE:
VIEQUES NASD SURVEY LAND TRANSFER & DISPOSAL OVERALL LOCATION SURVEY
PREPARED BY GLENN & SADLER AND LUIS BERRIOS MONTES & ASSOCIATES

Figure 2-2
SWMU 6 and Other IR Sites Location Map
Former NASD, West Vieques Island, Puerto Rico

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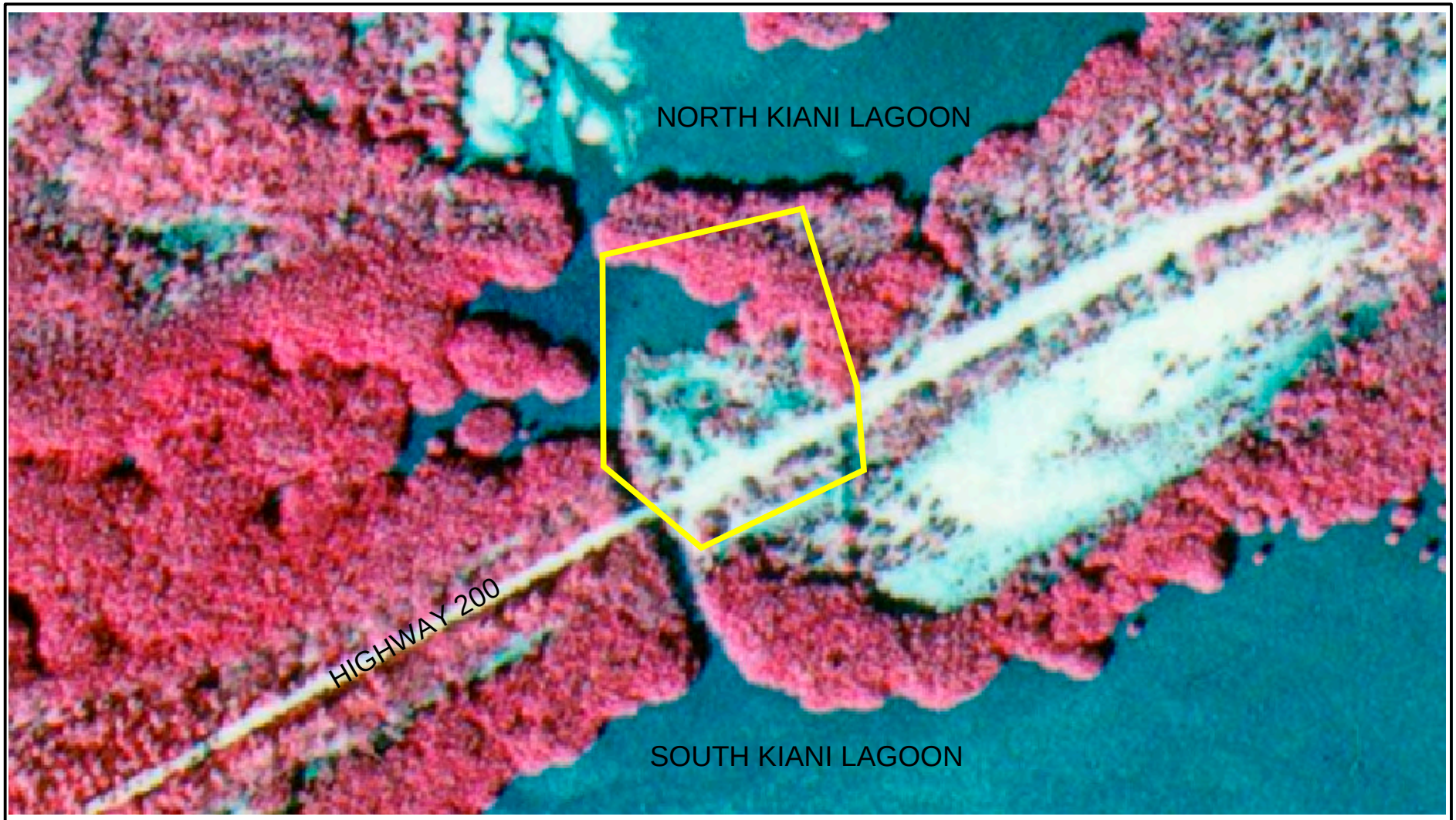
ES022007003TPA 180357.RI.DF.S6



Legend

Access Restriction Boundary

Source: 1994 Aerial Photograph

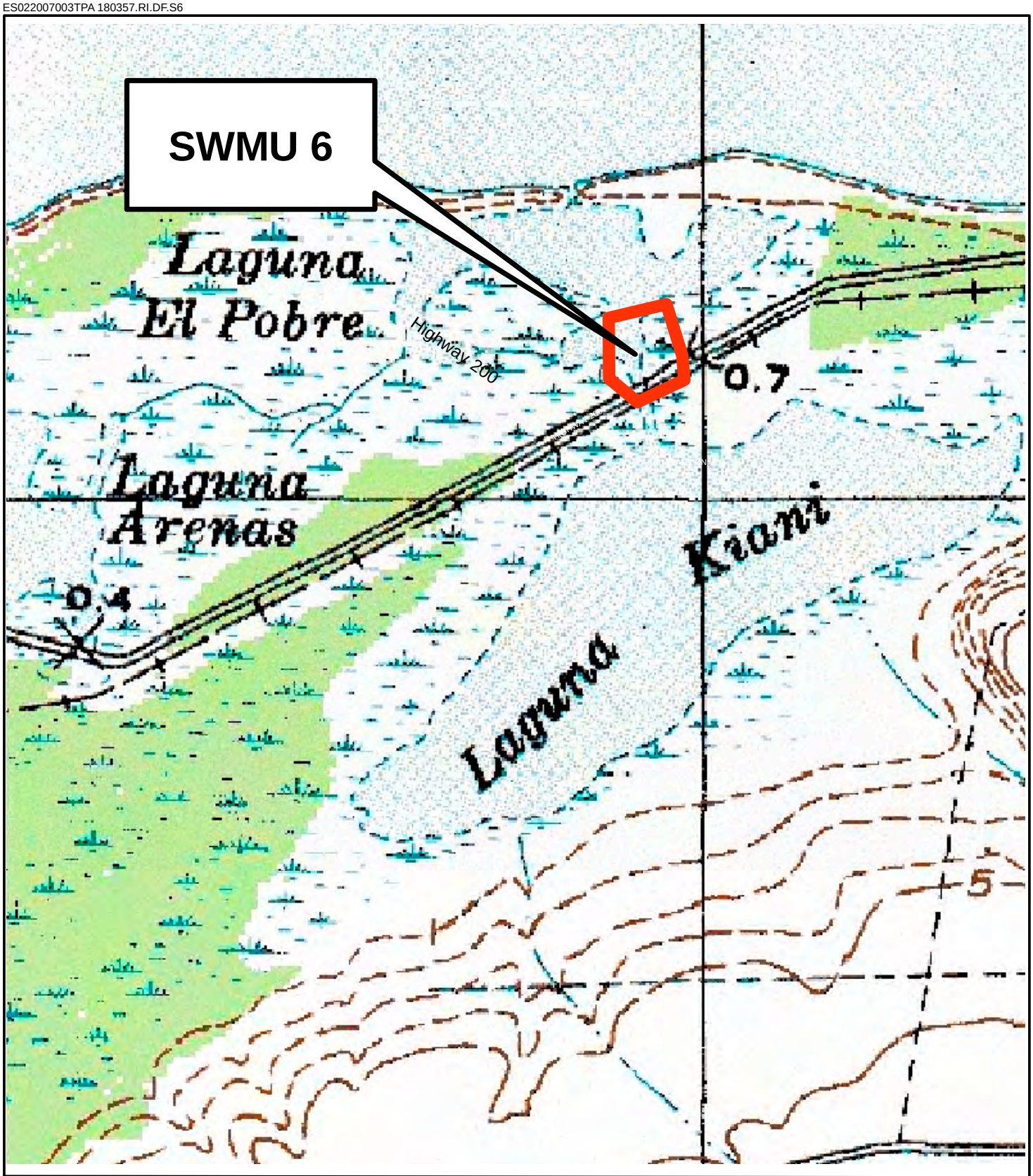
N
W E
S

200 100 0 200
Feet

FIGURE 2-3
Aerial Photograph
SWMU 6, Former NASD, Vieques, Puerto Rico

CH2MHILL

File Path: \\tampa\projects\Environmental\Navy CLEAN II_Vieques_ PR\Former NASD\GIS\Site Locations_RIFS.mxd, Date: February 16, 2004, User: JRIVERA1



Legend

Access Restriction Boundary

N
W E
S

190 0 190 Feet

Note: Dashed lines indicate 1 meter contours.
Solid lines indicate 10 meter contours.

Source: USGS, NOS/NOAA. Isla de Vieques Quadrangle 1941, revised 1982.

FIGURE 2-4
SWMU 6 Topographic Location Map
SWMU 6, Former NASD, Vieques, Puerto Rico

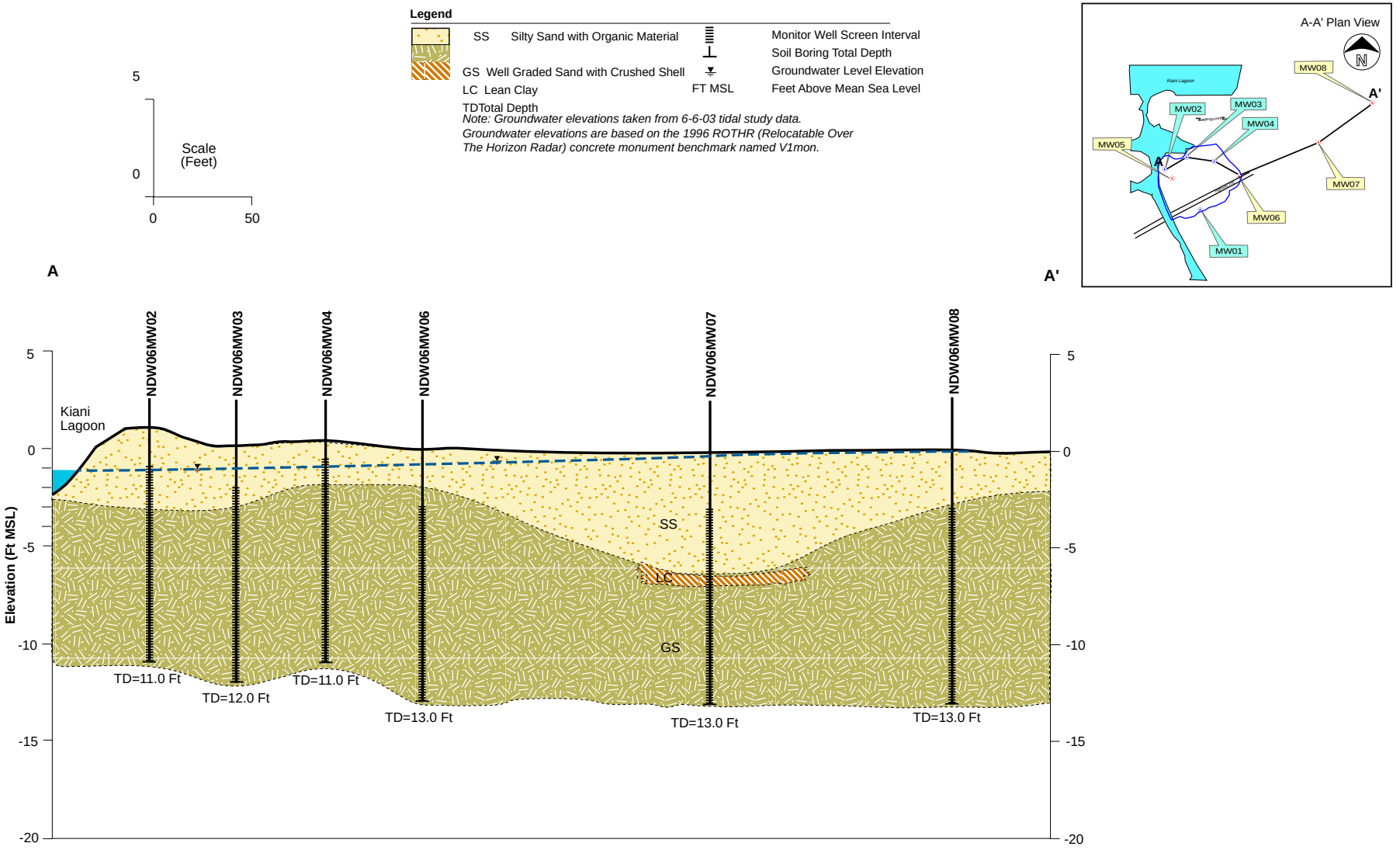
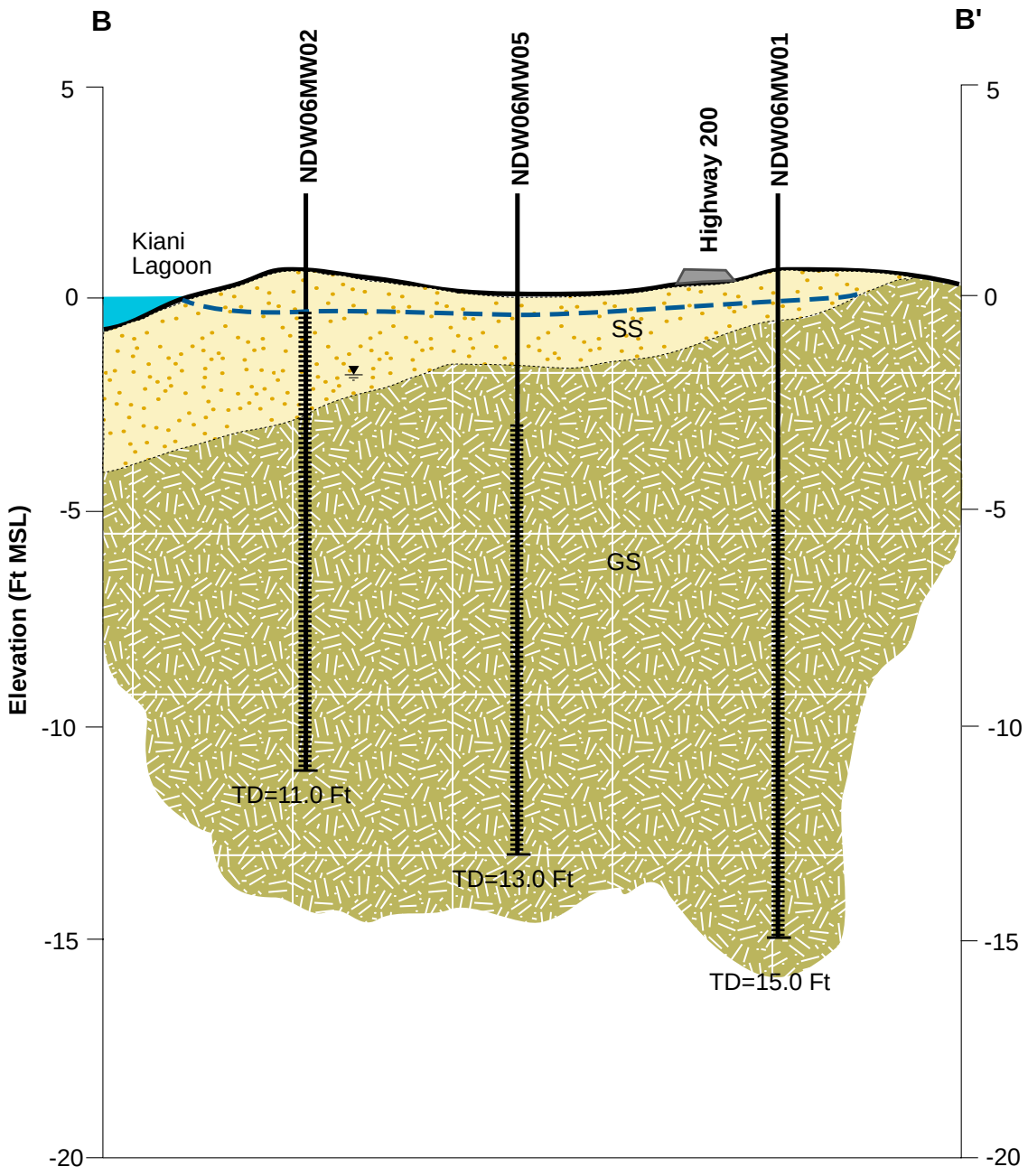
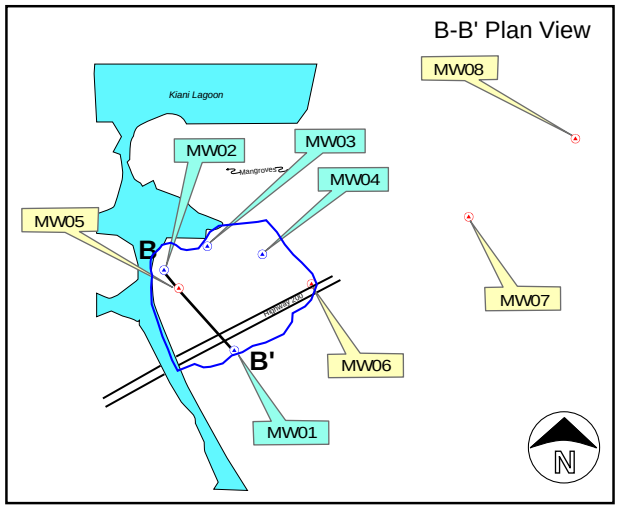
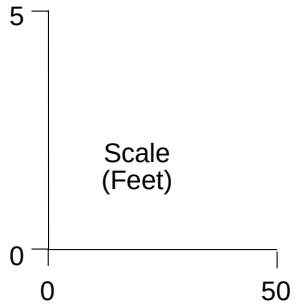


FIGURE 2-5
Geologic Cross-Section A-A'
SWMU 6, Former NASD, Vieques, Puerto Rico







Legend

SS	Silty Sand with Organic Material
GS	Well Graded Sand with Crushed Shell
TD	Total Depth
	Monitor Well Screen Interval
	Soil Boring Total Depth
	Groundwater Level Elevation
FT MSL	Feet Above Mean Sea Level

Figure 2-6
Geologic Cross-Section B-B'
SWMU 6, Former NASD, Vieques, Puerto Rico

CH2MHILL

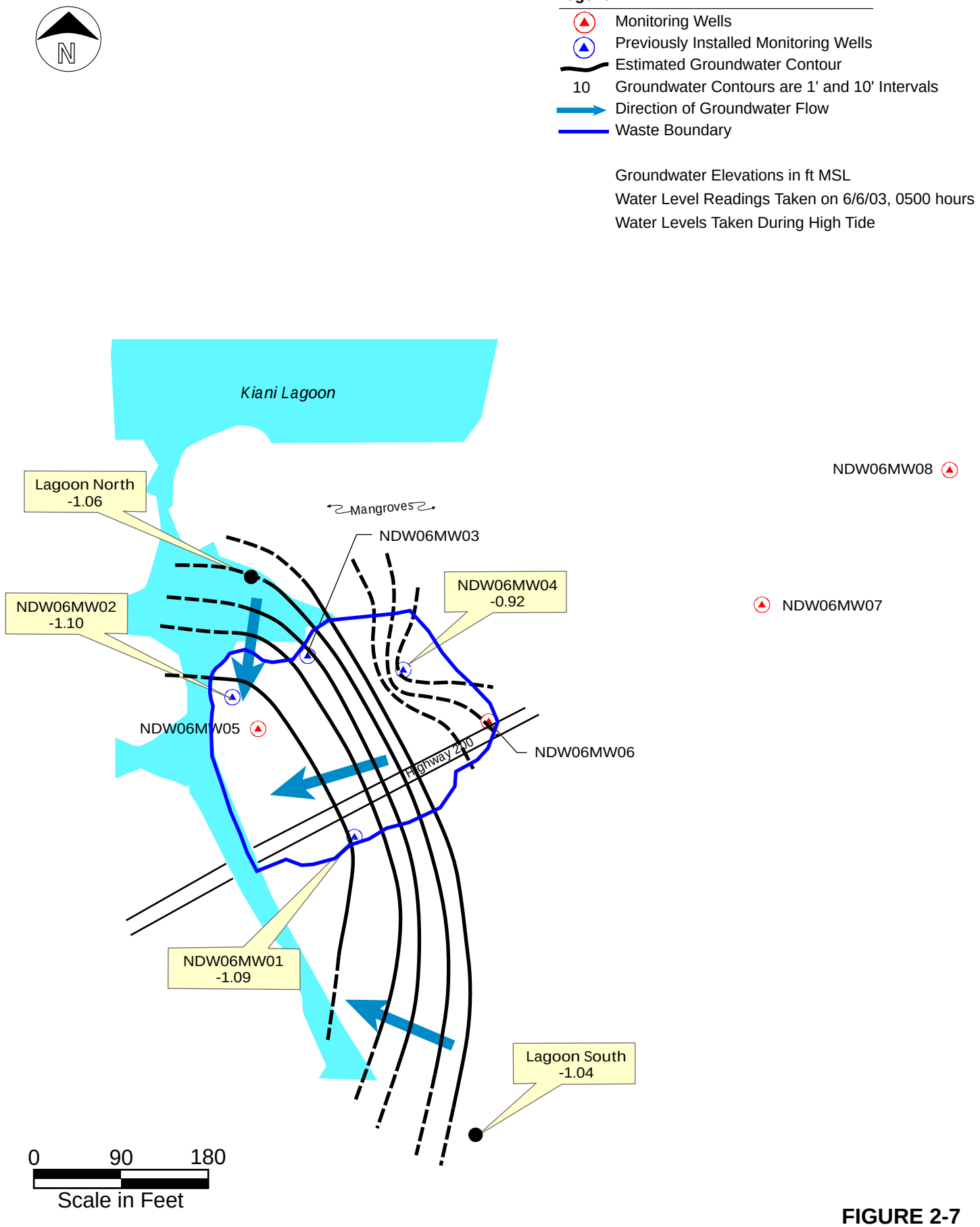


FIGURE 2-7
Groundwater Flow Map - High Tide
SWMU 6, Former NASD, Vieques, Puerto Rico

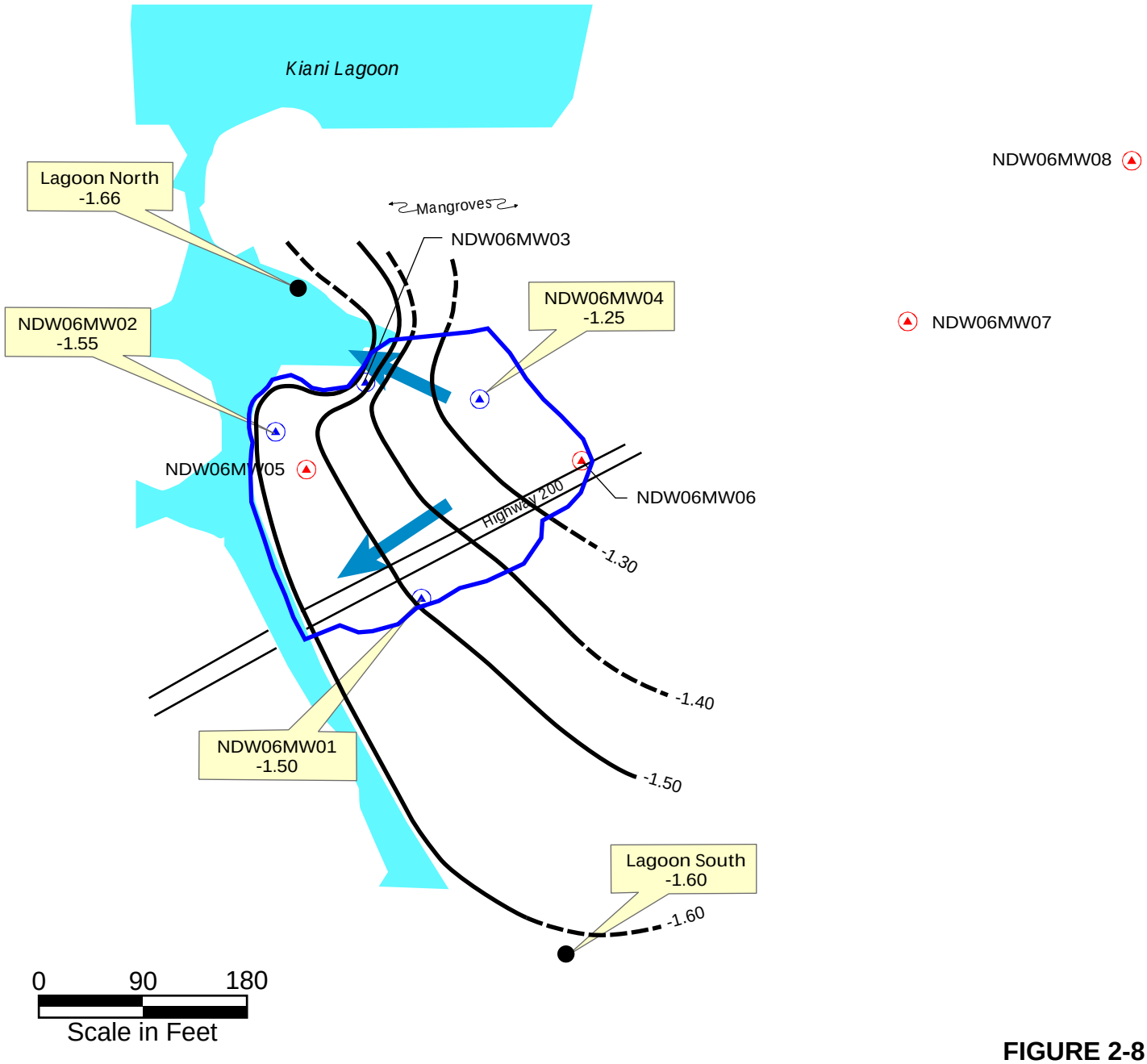


FIGURE 2-8
Groundwater Flow Map - Low Tide
SWMU 6, Former NASD, Vieques, Puerto Rico

FIGURE 2-9
Example of mangroves and deteriorated waste pile
SWMU 6, Former NASD, Vieques, Puerto Rico

FIGURE 2-10
Mangrove Disposal Site
SWMU 6, Former NASD, Vieques, Puerto Rico

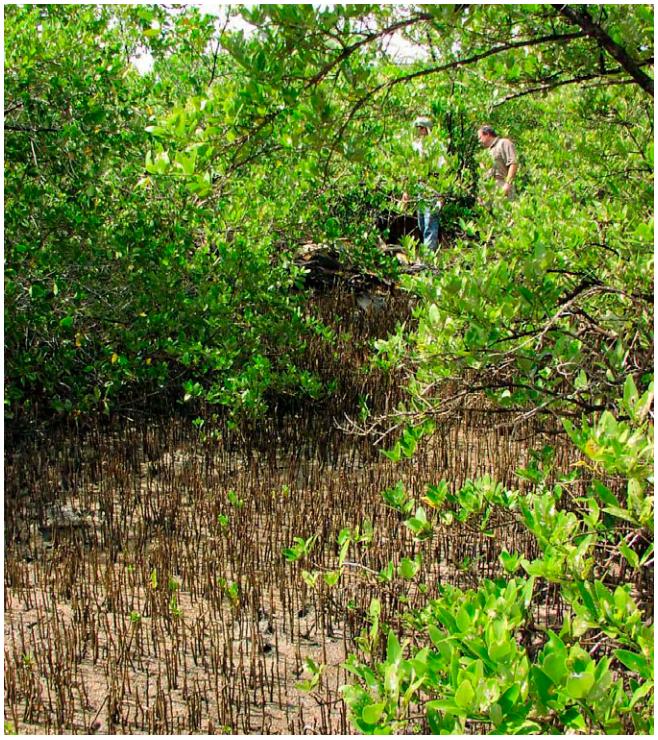


FIGURE 2-11
Metal bridge on Highway 200 over canal, southwest of site
SWMU 6, Former NASD, Vieques, Puerto Rico

FIGURE 2-12
View facing north of canal between lagoons, separated from waste area by a berm
SWMU 6, Former NASD, Vieques, Puerto Rico

FIGURE 2-13
View facing east of fence separating SWMU 6 from Highway 200
SWMU 6, Former NASD, Vieques, Puerto Rico

SECTION 3

Summary of Field Investigation

The RI field investigation at SWMU 6 included monitoring well installation and sampling, surface soil sampling, sediment sampling, surface water sampling, groundwater elevation monitoring and surveying, a tidal study, and a geophysical study to delineate waste boundaries. The field investigation was conducted at SWMU 6 from June 10, 2003, through October 2, 2003.

Data were collected in accordance with the standard operating procedures (SOP) presented in the facility-wide Master Work Plan (CH2M HILL, 2001a) and with the Field Sampling Plan presented in the Final RI Work Plan (CH2M HILL, 2003b); both work plans were reviewed by EPA and PREQB. Brief descriptions of the field procedures used during the RI field investigations are provided in the following subsections. Detailed descriptions of the field investigations can be found in the Final RI Work Plan (CH2M HILL, 2003b).

The munitions and explosives of concern (MEC) avoidance survey, environmental media sampling, hydraulic tidal study, and geophysical survey are described below.

3.1 MEC Avoidance Survey Results

A MEC avoidance survey was conducted by USA Environmental Inc. to ensure that all surface and subsurface sampling locations and well drilling locations within SWMU 6 were clear of any munitions items. MEC avoidance activities were also conducted during the brush clearing phase in June 2003 before initiation of geophysical surveying activities. USA Environmental activities were prescribed in the MEC avoidance plan, which is part of the work plan that described the procedures to clear sites for environmental investigations. A sweep for MEC, formerly called unexploded ordnance (UXO), was conducted by certified MEC technicians for any visible objects at the surface. Subsurface inspection of the subsurface soil sampling areas and new well locations was conducted using downhole magnetometers for every 2 feet of subsurface advancement up to a maximum of 10 feet in depth for the identification of any metal objects. USA Environmental also conducted a visual sweep of the waste area and did not find any unexploded munitions items. Ordnance-related scrap items previously identified at SWMU 6 include concrete-filled practice bombs, empty bomb dispensers, and empty shell casings. The MEC avoidance survey report is included as Appendix A.

3.2 Soil Sampling

3.2.1 OVM Soil Screening

Soil samples were screened in the field with a photoionization detector (PID), also known as an organic vapor meter (OVM). PID readings were recorded on the soil boring logs (Appendix B). Soil samples were collected and screened in accordance with the procedures outlined in the Master Work Plan.

3.2.2 Surface Soil Samples and Analysis

Surface soil samples were collected from the surface to 6 inches bls. The top layer of grass and soil (approximately 1 inch) was scraped away before sampling began. Surface soil samples were collected using a stainless steel hand auger, then placed in a stainless steel bowl and mixed with a stainless steel spoon. Samples for volatile organic compound (VOC) analysis were collected first using an Encore™ sampling device, followed by samples for SVOCs, metals, pesticides, polychlorinated biphenyls, perchlorate and explosives. The soil was thoroughly mixed after collection of VOC samples and transferred to appropriate laboratory jars.

Table 3-1 provides a listing of soil sample parameters and methods and includes the number of soil samples to be collected as part of this evaluation, including QA/QC samples. Details regarding the required containers, preservatives, and holding times for groundwater and soil samples are presented in field sampling plan for the former NASD (CH2M HILL, 2001a).

Fifteen surface soil samples (NDW06SS09 through NDW06SS23) were collected to define the horizontal extent of soil contamination in the source area. Four surface soil samples were collected to the north, southeast, and west of monitoring well NDW06MW04 to identify the presence and levels of PCBs in soils in this area. Five surface soil samples were completed along the northeastern boundary of the landfill beyond the previous geophysical survey area to further characterize the extent of fill material and soil contamination to the northeast. One surface soil sample was completed between the existing boring NDW06SB02 and existing well NDW06MW02. Four soil samples were completed within the vicinity of the previously defined southeastern boundary. One soil sample was collected in the northwest corner of the site as requested by EPA. The locations of the surface soil samples are shown on Figure 3-1 and listed with the northing and easting coordinates in Table 3-2. As noted in Section 2, soil samples were not collected within the debris piles due to potential safety concerns. However, soil samples were collected in locations immediately adjacent to waste piles.

Subsurface soil samples described in the RI Work Plan were not collected because groundwater was encountered at a shallow depth (approximately 1 foot). Previous soil boring locations sampled during the Expanded PA/SI are shown in Figure 3-2.

Sampling equipment including sampling spoons, hand augers, and bowls were decontaminated between each sample location using the following procedure:

- Rinse with potable water to remove most of the soil
- Wash with scrub brush using potable water and Alconox (nonphosphate soap)
- Rinse with potable water
- Rinse with laboratory grade deionized water
- Rinse with isopropyl alcohol
- Rinse with laboratory grade deionized water
- Air dry

3.3 Groundwater Monitoring Well Installation, Development, and Sampling

3.3.1 Monitoring Well Installations

Four new monitoring wells were added to the network of four monitoring wells that currently exist at the site. All sample locations and well elevations were surveyed in accordance with the Civil Surveying SOP included in the Master Work Plan. The monitoring wells were installed using the hollow stem auger method and the hand auger method to advance the well borings. In addition, soil cuttings were observed to document stratigraphy. MEC avoidance was conducted during setup and actual drilling operations at the site and is outlined in Appendix A. Groundwater at this site has a relatively flat gradient, and the flow direction is directly influenced by the tidal fluctuations.

The rationale for selection of the well locations is as follows:

- Monitoring well NDW06MW05 was installed approximately 50 feet south of existing well NDW06MW02 to assess contamination in the southwest part of the site.
- Monitoring well NDW06MW06 was installed approximately 100 feet southeast of existing well NDW06MW04 to assess possible contaminants near the eastern boundary of the site.
- Monitoring well NDW06MW07 was installed approximately 250 feet northeast of new monitoring well NDW06MW06 to assess site background conditions.
- Monitoring well NDW06MW08 was installed approximately 250 feet northeast of well NDW06MW07 to assess site background conditions.

The depth of the well was based on the water level measurements of the surrounding wells. New monitoring wells were constructed similarly to existing wells. Well depths and screened intervals are shown in Table 3-3. Well location and top of casing (TOC) elevations are shown in Table 3-4.

New wells were constructed using 10 feet of 0.01-inch slot polyvinyl chloride (PVC) well screen coupled with 1 foot of 2-inch-diameter Schedule 40 PVC casing using flush joint threads. The locations of these monitoring wells are illustrated in Figure 3-3.

Previous monitoring well locations are shown in Figure 3-3. The nomenclature for the previous monitoring wells was changed to match the current nomenclature scheme. Previous monitoring wells W6-MW01 through W6-MW04 were renamed NDW06MW01 through NDW06MW04.

Drill cuttings generated during monitoring well installation were collected and stored onsite in 55-gallon drums. The disposal method for these cuttings was determined based on results of the soil and groundwater analyses as specified in the investigation-derived waste management plan (CH2M HILL, 2000f).

Drill rigs and auger flights were decontaminated by using a high-pressure cleaner with potable water before use and between borings. Sampling equipment including, split-spoons,

and hand augers, were decontaminated between each sample location using the following procedure:

- Rinse with potable water to remove most of the soil
- Wash with scrub brush using potable water and Alconox (non-phosphate soap)
- Rinse with potable water
- Rinse with laboratory grade deionized water
- Rinse with isopropyl alcohol
- Rinse with laboratory grade deionized water
- Air dry

Well completion logs are presented in Appendix C.

3.3.2 Monitoring Well Development and Purging

Well development was performed after the grout used to construct the well had been allowed to adequately set for at least 24 hours. The groundwater levels were measured to the nearest 0.01 foot from the top of the PVC casing. Development consisted of removing at least three borehole volumes of water. Development continued until groundwater appeared clear. Well development information is presented in Appendix D.

Monitoring well development was performed either by using a Whale centrifugal submersible pump with a combination of pumping and swabbing with the pump or by a peristaltic pump and a bailer in which the well was surged with the bailer and then water was pumped out with the peristaltic pump.

The submersible pump was placed at the bottom of the screen and the well was pumped until clear water (minimal turbidity) was produced. The pump or a bailer was then moved up and down (swabbed) through the screened interval to force water in and out of the screen. The turbidity would increase when the pump was moved up to a new portion of the screen. Pumping and swabbing continued until clear, sediment-free water was generated.

Pumps and bailers were decontaminated between each sample location using the following procedure:

- Rinse with potable water
- Wash with scrub brush using potable water and Alconox (nonphosphate soap) and run pump in large tub
- Rinse and cycle pump with potable water
- Rinse with laboratory grade deionized water
- Air dry

3.4 Groundwater Elevation Measurements

Groundwater elevation measurements were obtained from all monitoring wells at SWMU 6 on September 10, 2003. An electronic water level meter was used to measure the depth to water from the top of casing of each monitoring well. Table 3-5 summarizes the results of these measurements. Figure 2-7 illustrates the results of the groundwater measurements taken at SWMU 6. The general groundwater flow direction is toward the west, but this

direction can change depending on the tides. At high tide, groundwater flow is to the southwest, and at low tide groundwater flow is to the northwest.

3.4.1 Monitoring Well Sampling and Analysis

The four newly installed monitoring wells and four previously existing wells were sampled for VOCs, SVOCs, pesticides, PCBs, explosives (including perchlorate), anions, alkalinity, total and dissolved metals to evaluate the potential presence of these constituents. The dissolved (filtered) samples were field-filtered prior to preservation using a 0.45-micron filter. The filter was flushed with water prior to use, then attached to the discharge end of the Teflon® sampling tubing and the filtered metals samples were collected.

Groundwater sampling was conducted in accordance with the techniques described in the master work plan. A round of water level measurements was first taken from all of the wells. The wells were then purged and sampled using low-flow sampling techniques to minimize turbidity of the samples. Table 3-6 presents the number of groundwater samples collected in this study, including QA/QC samples. The field sampling plan for the former NASD (CH2M HILL, 2001a) presents details regarding the required containers, preservatives, and holding times for groundwater and soil samples. Time-series water level measuring was conducted as well as a hydraulic tidal influence study.

The wells were sampled with a bladder pump for VOCs and a peristaltic pump for all other parameters. During the peristaltic pump sampling Teflon® tubing was used. New separate Teflon® tubing was used for each well.

A minimum of three well volumes of water were pumped from each well prior to sampling. The wells were pumped at a rate of approximately 0.06 to 0.22 gallon per minute (gpm). Water quality data including temperature, specific conductance, oxidative-redox potential (ORP), dissolved oxygen, turbidity, and pH were monitored during purging, and the well was sampled after the parameters stabilized to less than 10 percent fluctuation.

The pumps and cables were decontaminated between wells by:

- Wash with scrub brush using potable water and Alconox (nonphosphate soap)
- Rinse with potable water
- Rinse with laboratory grade deionized water
- Rinse with isopropyl alcohol (cables only)
- Rinse with laboratory grade deionized water
- Air dry

Appendix E includes monitoring well groundwater sampling logs.

3.4.2 Background Groundwater Well Sampling

Monitoring well NDW06MW07 was installed approximately 250 feet northeast of new monitoring well NDW6MW06. Monitoring well NDW06MW08 was installed approximately 250 feet northeast of well NDW06MW07 to assess site background conditions. These wells were sampled using a peristaltic pump and bladder pump (VOCs) as described above.

3.5 Surface Water and Sediment Sampling

3.5.1 Surface Water Sampling

Five of the seven surface water sampling points used for the Expanded PA/SI (NDW06SW02, NDW06SW03, NDW06SW05, NDW06SW06, and NDW06SW07) were again sampled during the RI. Figure 3-4 shows the surface water sampling locations. Sample NDW06SW06B was collected approximately 1,000 feet southwest of the previous sample location (NDW06SW06A). This is the result of difficulty in the field locating the previous sample location. The same situation applies to sample NDW06SW07B, which was collected approximately 400 feet east of the previous sample location (NDW06SW07A). Note that locations SW06A and SW07A were collected during the PA/SI to serve as background surface water data for SWMU 6. Although samples SW06B and SW07B were not collected from the same locations as SW06A and SW07A, respectively, they do help provide a better understanding of the nature and extent of constituents in surface water adjacent to the site. Further, samples SW06A and SW07A were not used for background comparisons made during the RI; samples SW10 and SW11 were used for this purpose, as described below. Two additional surface water samples were collected (NDW06SW08 and NDW06SW09) from approximately 100 feet north and 80 feet east of well NADW06MW04. Also, two background surface water samples (NDW06SW10 and NDW06SW11) were collected from Arenas Lagoon. One set of samples was field-filtered and preserved in order to ascertain the contribution of the dissolved constituents. Surface water sampling was conducted in accordance with the techniques described in the master work plans.

These five existing, two background, and two new surface water samples were analyzed for total and dissolved metals, explosives, perchlorate, SVOCs, VOCs, pesticides, and PCBs. Surface water samples were analyzed for total metals (unfiltered) and dissolved metals (filtered). The filtered samples were field-filtered prior to preservation using a 0.45-micron filter. The filter was flushed with water prior to use, then attached to the discharge end of the Teflon® sampling tubing and the filtered metals samples were collected.

Surface water samples were collected at mid-depth of the water column. Samples were collected into a pre-cleaned 2-liter glass jar provided by the laboratory. One liter of the sample was transferred to the total metals container, and the other 1-liter was field-filtered and preserved for dissolved metals. A second aliquot was collected for the major anions analyses and split into dissolved and total fractions as described above for metals. Table 3-7 presents the number of surface water samples collected as part of this evaluation, including QA/QC samples. The field sampling plan for the former NASD (CH2M HILL, 2001a) presents details regarding the required containers, preservatives, and holding times for surface water samples.

Parameters measured and logged in the field included temperature, pH, DO, ORP, specific conductance, salinity, and turbidity. Appendix F shows the surface water sampling logs. Table 3-8 shows the location and elevation of the surface water samples collected within SWMU 6.

3.5.2 Sediment Sampling and Analysis

Seven sediment samples were collected as part of the Expanded PA/SI. Twelve sediment samples were collected during the RI. Sediment sampling locations are shown in Figure 3-5. Six of these samples were collected south of SWMU 6, three west of SWMU 6, and three north of SWMU 6, as agreed to by PREQB at the January 16, 2003, CTC meeting. Five of these sample locations (NDW06SD02, NDW06SD03, NDW06SD05, NDW06SD06, and NDW06SD07) were previously sampled during the Expanded PA/SI. Sample NDW06SD06B, as shown in Figure 3-5, was collected approximately 1,000 feet southwest of the previous sample location because of difficulty finding the previous sampling location (NDW06SD06A). The same applies to sample NDW06SD07B, which was collected approximately 400 feet east of the previous sample location (NDW06SD07A). As with the co-located surface water samples, locations SD06A and SD07A were collected during the PA/SI to serve as background sediment data for SWMU 6. Although samples SD06B and SD07B were not collected from the same locations as SD06A and SD07A, respectively, they do help provide a better understanding of the nature and extent of constituents in sediment adjacent to the site. Further, samples SD06A and SD07A were not used for background comparisons made during the RI; samples SD15 and SD16 were used for this purpose, as described below. Two background sediment samples (NDW06SD15 and NDW06SD16) were co-located with surface water samples NDW06SW10 and NDW06SW11, which were collected from the adjacent Arenas Lagoon.

Table 3-9 presents the numbers of sediment samples, parameters, and methods used as part of this evaluation, including QA/QC samples. The field sampling plan for the former NASD (CH2M HILL, 2001a) presents details regarding the required containers, preservatives, sampling, and holding times for groundwater and soil samples.

Sediment samples were collected at a depth of 0 to 6 inches below the lagoon bottom from a boat using a hand auger or ponar sampling device. A new sediment sample (NDW06SD14) was collected 240 feet north of the bridge and 80 feet from the northeastern shoreline. New sediment samples NDW06SD13 and NDW06SD12 were located on a line parallel to the bridge and equidistant from the bridge with PA/SI sediment NDW06SD02, which was also sampled. Two other new sediment samples, NDW06SD11 and NDW06SD10 were collected on the south side of the bridge on the same perpendicular line bisecting the bridge with sediment samples NDW06SD13 and NDW06SD02, respectively. Sediment sample NDW06SD09 was collected southeast of the bridge approximately 300 feet and 40 feet from the eastern shoreline. Sediment sample NDW06SD08 was within 150 feet east of sediment sample NDW06SD09 and also 40 feet from the northeastern shoreline. Figure 3-5 presents the sediment sampling locations.

The applicable SOP for the collection of sediment samples is presented in the field sampling plan for the former NASD (CH2M HILL, 2001a). Details regarding the required containers, preservatives, and holding times for groundwater and soil samples are presented in the field sampling plan for the former NASD (CH2M HILL, 2001a).

Appendix F includes sediment sampling logs. Table 3-10 shows the location and elevation of the 14 sediments samples.

Sampling equipment for the surface water and sediment sampling including the Whale pump, ponar sampler, and bowls. This equipment was decontaminated between each sample location using the following procedure:

- Rinse with potable water to remove most of the soil
- Wash with scrub brush using potable water and Alconox (nonphosphate soap)
- Rinse with potable water
- Rinse with laboratory grade deionized water
- Rinse with isopropyl alcohol
- Rinse with laboratory grade deionized water
- Air dry

3.5.3 Background Surface Water and Sediment Sampling

Because surface water levels and flow are tidally influenced around SWMU 6, a background sample point cannot be distinctly identified within the surrounding area. As discussed above, two surface water samples and two sediment samples were collected from nearby Arenas directly west of SWMU 6. Two surface water and sediment samples were previously collected from this water body and included in the background sampling report.

The two new surface water and sediment samples were collected from south Kiani Lagoon during this RI sampling effort (NDW06SW06B/SD06B and NDW06SW07B/ SD07B). The locations of these two sampling points are presented in Figure 3-4.

Two background surface water samples (NDW06SW10 and NDW06SW11) and two background sediment samples (NDW06SD15 and NDW06SD16) were collected from Arenas Lagoon.

3.6 Hydraulic Tidal Study

A hydraulic tidal study was conducted at SWMU 6 from June 5 through June 7, 2003. This study was conducted in response to EPA comments in regard to the groundwater elevations recorded during the Expanded PA/SI and the apparent changing direction of groundwater flow on this site. Groundwater and lagoon water level measurements were collected from monitoring wells NDW06MW01, NDW06MW02, and NDW06MW04 and two stilling wells installed in Kiani Lagoon. Monitoring well NDW06MW01 is farthest south within SWMU 6, just south of Highway 200 and approximately 80 feet from the tidal canal connecting the Kiani Lagoons. Monitoring well NDW06MW02 is in the northwest corner of SWMU 6 along the mangrove edge of the tidal canal, closest to the northernmost lagoon. Monitoring well NDW06MW04 is in the northeast corner of SWMU 6 farthest from the tidal canal. One stilling well was located within the small lagoon just north of the site along the mangrove edge, and one was located south of SWMU 6 within the larger Kiani Lagoon along the mangrove edge. These stilling wells are referred to as North Lagoon and South Lagoon, respectively. Monitoring well and stilling well locations within SWMU 6 are presented in Figure 3-3. The northern border of SWMU 6 is approximately 400 feet south of Vieques Passage. Kiani Lagoon is connected to Vieques Passage by a tidal canal that runs in a north-south direction along the west side of SWMU 6.

Water levels were obtained by measuring the depth to water from a marked location on the TOC that was surveyed to the nearest 0.01 foot msl. Time-series water level data were obtained using an in situ data logger, which provided digital water level recordings in the three monitoring wells and two stilling wells. Stilling wells were installed by pushing slotted PVC pipe into the lagoon sediments. The data logger transducers were then suspended inside the slotted section and secured. Water levels were recorded at approximately 10-minute intervals for a 72-hour period.

Figure 3-6 graphically shows water level data, corrected to msl, for the monitoring wells NDW06MW01, NDW06MW02, and NDW06MW04 and the North Lagoon and South Lagoon stilling wells. The stilling wells show tidal fluctuations of approximately 0.7 foot. For reference, tidal data compiled by NOAA were obtained from the nearest tide gauge, which is located at the La Puntilla station, San Juan Bay, Puerto Rico. This location indicated a tidal fluctuation of up to 1.5 feet during the same time period of the SWMU 6 tidal study, as shown in Figure 3-6. The tidal dataset shows a strong correlation in periodicity and temporal scales with the SWMU 6 monitoring wells and the lagoon stilling wells. The tidal fluctuations noted in monitoring wells NDW06MW01, NDW06MW02, and NDW06MW04 showed a range of approximately 0.4 foot over the three-day monitoring period. This indicates that flooding and ebbing tides have a potentially significant influence on groundwater quality and flow direction within SWMU 6. Saltwater is flushing back and forth in the shallow aquifer, will increase the salinity of the groundwater, and could potentially dilute and move contamination.

The tidal influence can be observed by changes in elevations in the tides that correspond to surface water and groundwater elevation changes within SWMU 6. The flooding and ebbing tide appears to have a direct influence on the surface water/groundwater flow directions, which appear to change from north to south depending on the tidal stage. Figure 3-6 presents groundwater elevation changes between NDW06MW01 and NDW06MW02 that are based on a flooding tide or ebbing tide. At low tide, NDW06MW01 has a higher groundwater elevation than NDW06MW02, which corresponds to groundwater flow direction to the north; the reverse is true for a time just before high tide when NDW06MW02 has a higher groundwater elevation than NDW06MW01 and the flow of groundwater would be to the south. This is consistent with their locations relative to Vieques Passage and Kiani Lagoon. During a flooding tide, NDW06MW02 is influenced first because it is closer to the tidal canal, which rises first with an incoming tide from Vieques Passage. Conversely, when the tide ebbs, monitoring well NDW06MW02 is again affected first, and the groundwater elevation is lower than in NDW06MW01 (see Figure 3-6).

Soils in SWMU 6 are consistent with a swamp or marsh geology. The soil is highly organic, with a mixture of fine to coarse silty sand. Generally the subsurface soils are in a loose matrix and very permeable.

Based on the water level data collected for monitoring wells NDW06MW01 and NDW06MW02 and the North Lagoon and South Lagoon stilling wells, groundwater flows to the south toward Kiani Lagoon during high tide periods and to the north away from Kiani Lagoon during low tide periods. The groundwater elevation in monitoring well NDW06MW04 was consistently higher than in monitoring wells NDW06MW01 and NDW06MW02 and consistently higher than the surface water elevations in Kiani Lagoon during the study. Although NDW06MW04 was also influenced by tidal fluctuations, it does

not appear that the groundwater flow direction changes in this area. These data indicate that groundwater flow and direction are influenced by tidal action, as observed by the response in the monitoring wells located in SWMU 6. The tidal influence is expected to have an impact on the groundwater quality based on the bidirectional transport across the site. The groundwater along the edge of the site (near monitoring wells NDW06MW01 and NDW06MW02) has a salinity similar to that of sea water (CH2M HILL, 2000d) and continuously flushes back and forth with the tides.

3.7 Surveying

The monitoring well locations and sampling locations (surface soil, soil borings, and sediment) were surveyed in the field using Differential Global Positioning System (DGPS) techniques by Transystems Inc. The survey established the latitude and longitude coordinates for each location. In addition, the elevation in feet above msl was established to the nearest 0.01 foot for the TOC of the monitoring wells using traditional surveying techniques and DGPS techniques for remote areas. Tables 3-2, 3-4, 3-8, and 3-10 provide the survey data. A complete listing of survey data can be found in Appendix G.

3.8 Geophysical Survey

NAEVA Geophysics Inc. was contracted to conduct a geophysical investigation at SWMU 6. The purpose of this investigation was to delineate the lateral extent of buried waste resulting from historical dumping activities at the site. The site was investigated using a combination of grids and transect lines based on terrain conditions and site-specific objectives. Within the grids established over the site, an electromagnetic (EM) survey was conducted using an EM-31 instrument. Transect lines established across the site were spaced approximately 12.5 feet apart, with data collection occurring every 5 feet along each transect. NAEVA used Global Positioning System (GPS) equipment to survey the corners of grids and the endpoints of transect lines, allowing the data to be plotted in NAD 83/UTM Zone 20N coordinates.

The results of the geophysical investigation indicated that the specific conductance and in-phase data at SWMU 6 are dominated by the near-surface saline water table. Correlation with documented surface material allows data interpretation with regard to subsurface material. Unstable specific conductance measurements, usually associated with the presence of buried debris, were found in areas exhibiting surface debris, especially in lines 1 and 3. The geophysical survey report is included in Appendix H.

TABLE 3-1
Soil Sample Parameters, Methods, and Quantities for SWMU 6
SWMU 6, Former NASD, Vieques, Puerto Rico

Parameter	Method	No. of Samples	Equipment Blanks	Field Blanks	Field Duplicates	Matrix Spike/ Duplicate	Total Number of Samples
Pesticides	8081A	15	2	1	2	4	24
PCBs	8082	15	2	1	2	4	24
SVOCs	8270C	15	2	1	2	4	24
Metals	6010B	15	2	1	2	4	24
Explosives	8330	15	2	1	2	4	24
Perchlorate	314.0	15	2	1	2	4	24
VOCs	8260B	15	2	1	2	4	24

Notes:
Equipment blanks – one per matrix per day; blank for filtered samples is a filtration blank
Field Blanks – one per lot of ERB source water
Field Duplicates – one per every ten samples per matrix/medium or per batch, whichever is most frequent
Matrix Spike/Matrix Spike Duplicates – One per 20 samples per matrix or batch, whichever most frequent

TABLE 3-2
Surface Soil Locations and Elevations
SWMU 6, Former NASD, Vieques, Puerto Rico

Boring #	Northing	Easting	Elevation (ft amsl)
NDW06SS09	2005099.5381	228971.0322	-0.197
NDW06SS10	2005103.1424	228969.9926	-0.225
NDW06SS11	2005106.8421	228974.1226	-0.311
NDW06SS12	2005103.9311	228976.8327	-0.313
NDW06SS13	2005095.6450	228928.4717	-0.208
NDW06SS14	2005113.0277	228966.6157	-0.358
NDW06SS15	2005119.6790	228972.3818	-0.405
NDW06SS16	2005119.1732	228978.0738	-0.354
NDW06SS17	2005111.9954	228980.2082	-0.377
NDW06SS18	2005107.3233	228981.0855	-0.394
NDW06SS19	2005101.2975	228982.4597	-0.403
NDW06SS20	2005111.1818	229019.6890	-0.325
NDW06SS21	2005092.7849	229000.3693	-0.335
NDW06SS22	2005097.5658	229012.0329	-0.353
NDW06SS23	2005106.5957	228919.0981	-0.247

Notes: amsl = above mean sea level

TABLE 3-3
Summary of Well Completion Details
SWMU 6, Former NASD, Vieques, Puerto Rico

Well ID	Date Installed	Boring Depth (ft bls)	Well Depth (ft bls)	Screen Interval Depth (ft bls)	Depth to Bentonite (ft bls)	Depth to Sandpack (ft bls)
NDW06MW05	08/23/03	13.0	13.0	3 - 13	0.0	1.0
NDW06MW06	08/20/03	13.0	13.0	3 - 13	0.0	1.0
NDW06MW07	08/20/03	13.0	13.0	3 - 13	0.0	1.0
NDW06MW08	08/19/03	13.0	13.0	3 - 13	0.0	1.0

TABLE 3-4
Monitoring Well Locations and Top of Casing Elevation
SWMU 6, Former NASD, Vieques, Puerto Rico

Boring #	Northing	Easting	Elevation (ft amsl)
NDW06MW05	2005084.8047	228926.9912	2.00
NDW06MW06	2005087.1604	228999.6686	2.19
NDW06MW07	2005123.9511	229085.6294	1.22
NDW06MW08	2005166.3333	229144.8558	0.97

Notes: amsl = above mean sea level

TABLE 3-5
Summary of Monitoring Wells Water Level Measurements
SWMU 6, Former NASD, Vieques, Puerto Rico

Well ID	Date	Top of PVC Elevation (ft amsl)	Depth to Water (ft)	Groundwater Level (ft amsl)
NDW06MW01	09/10/03	2.41	3.85	-1.44
NDW06MW02	09/10/03	3.11	4.64	-1.53
NDW06MW03	09/10/03	2.25	3.42	-1.17
NDW06MW04	09/10/03	2.46	3.77	-1.31
NDW06MW05	09/10/03	2.00	3.55	-1.55
NDW06MW06	09/10/03	2.19	3.67	-1.48
NDW06MW07	09/10/03	1.22	2.47	-1.25
NDW06MW08	09/10/03	0.97	2.30	-1.33

Notes: amsl = above mean sea level

TABLE 3-6
Groundwater Sample Parameters, Methods, and Quantities
SWMU 6, Former NASD, Vieques, Puerto Rico

Parameter	Method	No. of Samples	Equipment Blanks	Field Blanks	Field Duplicates	Matrix Spike/ Duplicate	Total Number of Samples
Pesticides	8081A	8	1	1	1	2	13
PCBs	8082	8	1	1	1	2	13
Total Metals	6010B	8	1	1	1	2	13
Dissolved Metals	6010B	8	1	1	1	2	13
VOCs	8260B	8	1	1	1	2	13
SVOCs	8270C	8	1	1	1	2	13
Explosives	8330	8	1	1	1	2	13
Perchlorate	EPA 314.0	8	1	1	1	2	13
IC Anions	EPA 300.0	8	1	1	1	2	13
Alkalinity	EPA 310.1	8	1	1	1	--	11

Notes:
Alkalinity will be reported as mg/L bicarbonate, carbonate, and/or hydroxide
Ion Chromatography anions include sulfate, chloride, nitrate, nitrite, and orthophosphate
Equipment blanks – one per day
Field Blanks – one per lot of ERB source water
Field Duplicates – one per every ten samples per matrix/medium or per batch, whichever is most frequent
Matrix Spike/Matrix Spike Duplicates – One per 20 samples per matrix or batch, whichever most frequent
Two wells (MW08 and 09) will be used as background data points for the SWMU 6.

TABLE 3-7
Surface Water Sample Parameters, Methods, and Quantities
SWMU 6, Former NASD, Vieques, Puerto Rico

Parameter	Method	No. of Samples*	Equipment Blanks	Field Blanks	Field Duplicates	Matrix Spike/ Duplicate	Total Number of Samples
Explosives	8330	9	1	1	1	2	14
Perchlorate	EPA 314.0	9	1	1	1	2	14
SVOCs	8270C	9	1	1	1	2	14
VOCs	8260B	9	1	1	1	2	14
Pesticides	8081A	9	1	1	1	2	14
PCBs	8082	9	1	1	1	2	14
IC Anions	EPA 300.0	9	1	1	1	2	14
Dissolved IC Anions	EPA 300.0	9	1	1	1	--	12
Alkalinity	EPA 310.1	9	1	1	1	--	12
Dissolved Alkalinity	EPA 310.1	9	1	1	1	--	12
Total Metals	6010B	9	1	1	1	2	14
Dissolved Metals	6010B	9	1	1	1	2	14

Notes:
Alkalinity will be reported as mg/L bicarbonate, carbonate, and/or hydroxide
Ion Chromatography anions include sulfate, chloride, nitrate, nitrite, and orthophosphate
Equipment blanks – one per matrix per day; blank for filtered samples is a filtration blank
Field Blanks – one per lot of ERB source water
Field Duplicates – one per every ten samples per matrix/medium or per batch, whichever is most frequent
Matrix Spike/Matrix Spike Duplicates – One per 20 samples per matrix or batch, whichever most frequent
* - Two surface water samples will be collected from adjacent Laguna to the west for background samples

TABLE 3-8
Surface Water Sampling Locations and Elevations
SWMU 6, Former NASD, Vieques, Puerto Rico

Boring	Northing	Easting	Elevation (ft amsl)
NDW0602	2005051.57330	228922.04890	-3.980
NDW0603	2005112.7555	228915.3806	-3.547
NDW0605	2005119.8667	228941.5796	-3.340
NDW0606	2004638.2397	228700.0409	-4.980
NDW0607	2005013.6464	229186.0681	-4.134
NDW0608	2004965.9398	229062.0735	-4.285
NDW0609	2004964.9626	228975.2998	-4.094
NDW0610	2005037.9901	228926.6101	-1.732
NDW0611	2005040.7826	228931.7005	-3.927

Notes: amsl = above mean sea level

TABLE 3-9
Sediment Sample Parameters, Methods, and Quantities
SWMU 6, Former NASD, Vieques, Puerto Rico

Parameter	Method	No. of Samples	Equipment Blanks	Field Blanks	Field Duplicates	Matrix Spike/ Duplicate	Total Number of Samples
Explosives	8330	14	1	1	1	2	19
Perchlorate	EPA 314.0	14	1	1	1	2	19
Pesticides	8081A	14	1	1	1	2	19
VOCs	8260B	14	1	1	1	2	19
SVOCs	8270C	14	1	1	1	2	19
PCBs	8082	14	1	1	1	2	19
Metals	6010B	14	1	1	1	2	19

Notes:
Equipment blanks – one per matrix per day; blank for filtered samples is a filtration blank
Field Blanks – one per matrix per day
Field Duplicates – one per every ten samples per matrix/medium
Matrix Spike/Matrix Spike Duplicates – One per 20 samples per matrix

TABLE 3-10
Sediment Sampling Locations and Elevations
SWMU 6, Former NASD, Vieques, Puerto Rico

Boring #	Northing	Easting	Elevation (ft amsl)
SS-09	2005099.5381	228971.0322	-0.197
SS-10	2005103.1424	228969.9926	-0.225
SS-11	2005106.8421	228974.1226	-0.311
SS-12	2005103.9311	228976.8327	-0.313
SS-13	2005095.6450	228928.4717	-0.208
SS-14	2005113.0277	228966.6157	-0.358
SS-15	2005119.6790	228972.3818	-0.405
SS-16	2005119.1732	228978.0738	-0.354
SS-17	2005111.9954	228980.2082	-0.377
SS-18	2005107.3233	228981.0855	-0.394
SS-19	2005101.2975	228982.4597	-0.403
SS-20	2005111.1818	229019.6890	-0.325
SS-21	2005092.7849	229000.3693	-0.335
SS-22	2005097.5658	229012.0329	-0.353

Notes: amsl = above mean sea level

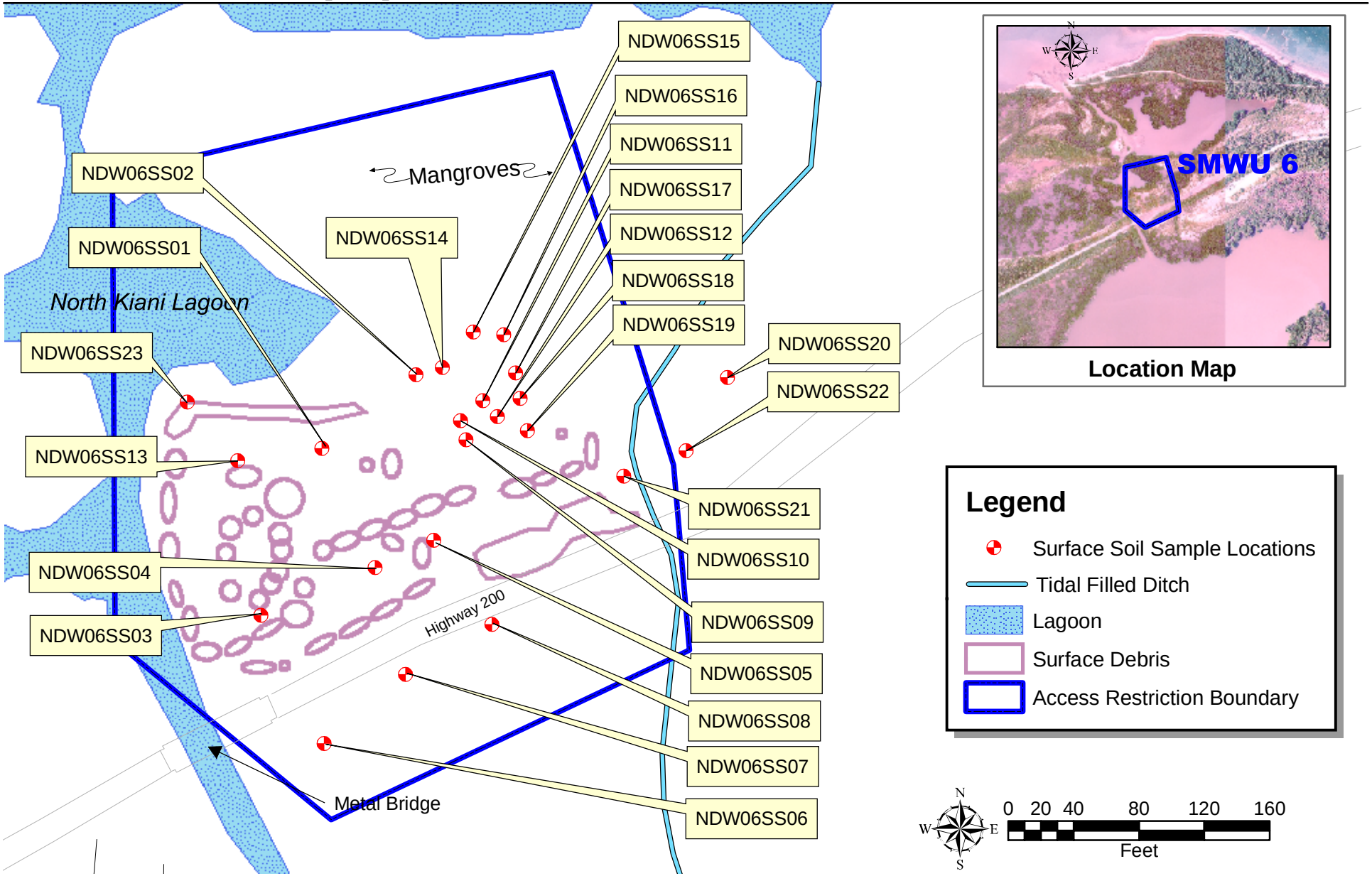


FIGURE 3-1
Remedial Investigation Surface Soil Location Map
SWMU 6, Former NASD, Vieques, Puerto Rico

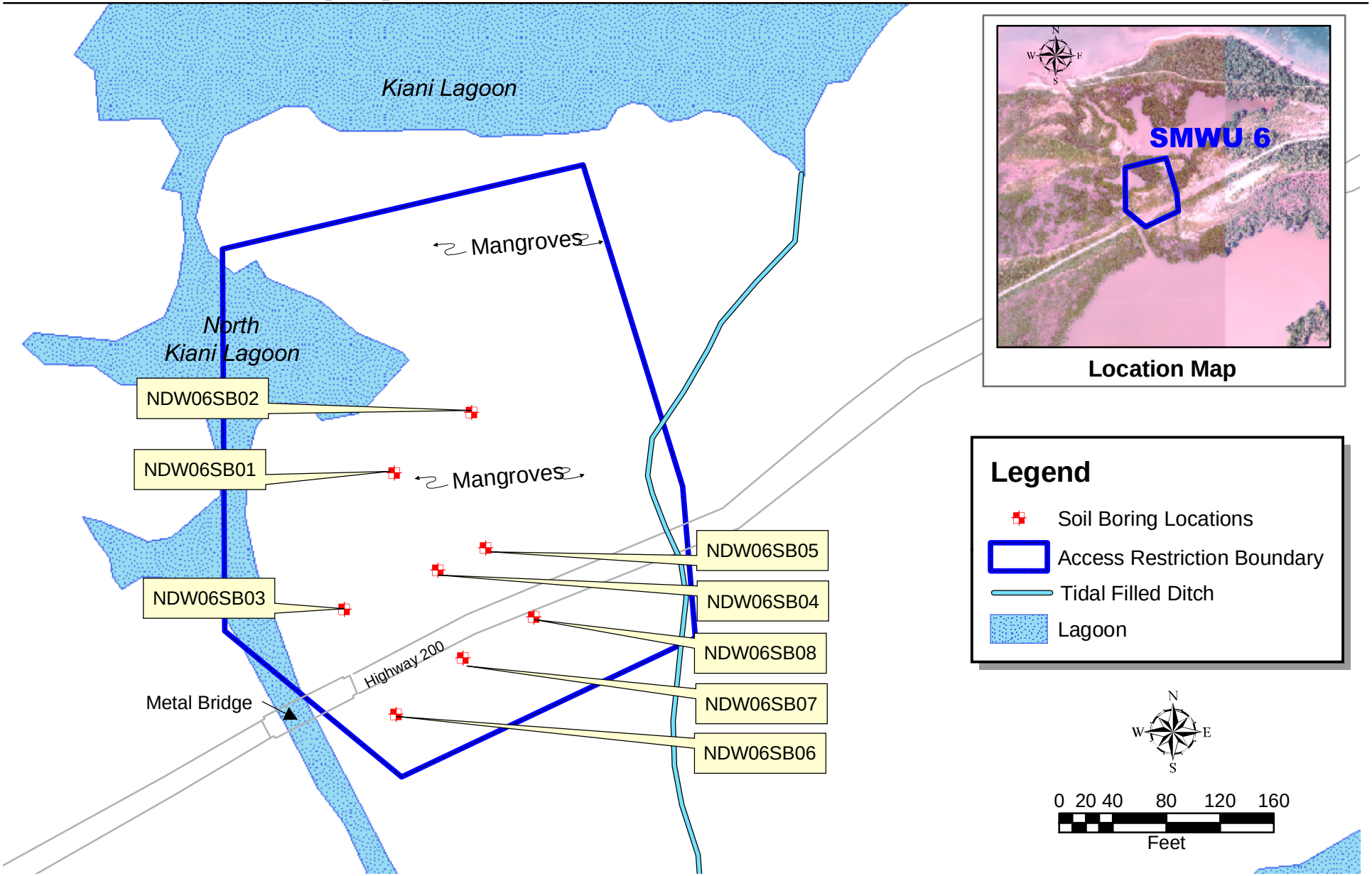


FIGURE 3-2
Remedial Investigation Soil Boring Location Map
SWMU 6, Former NASD, Vieques, Puerto Rico

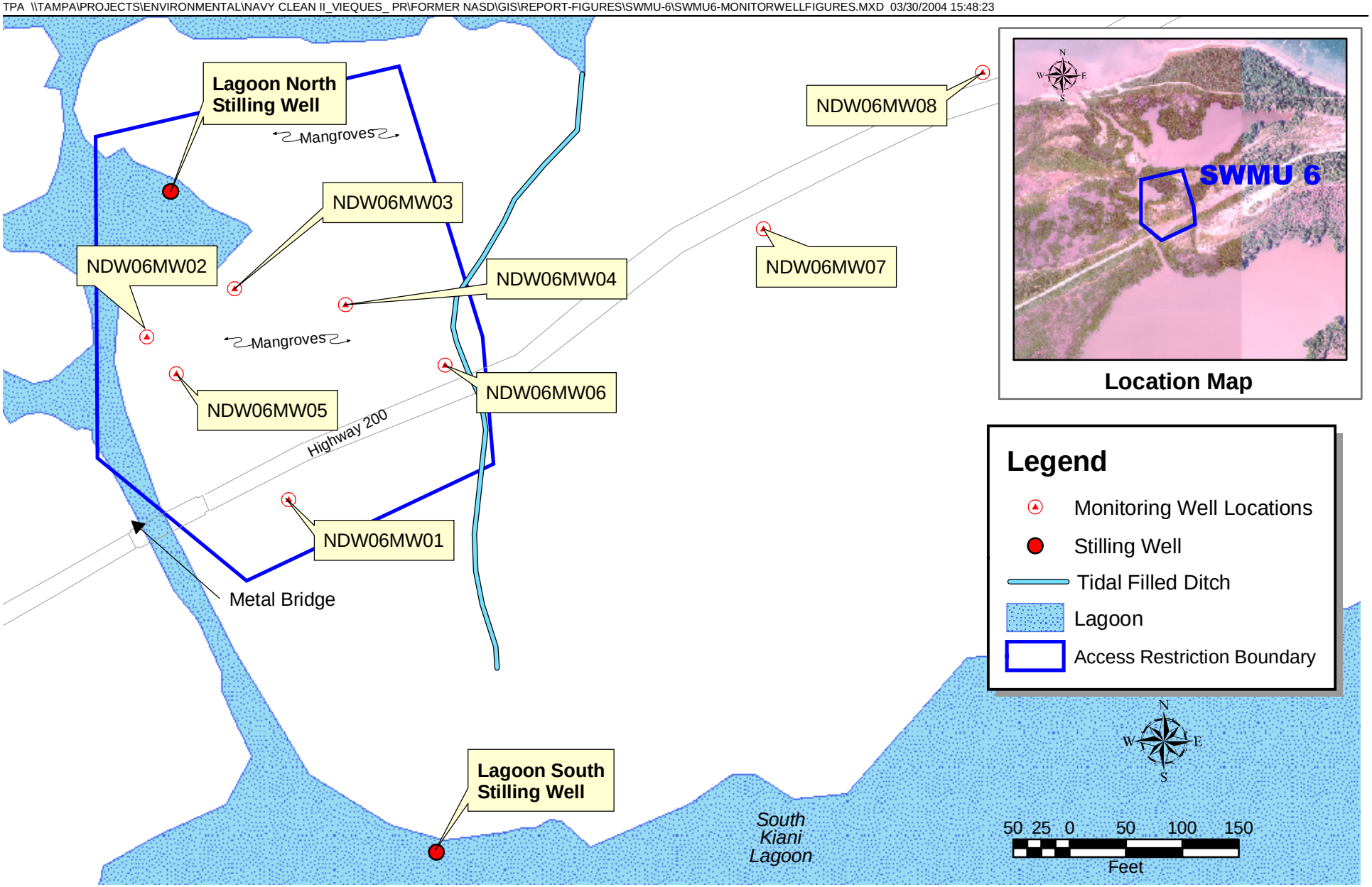
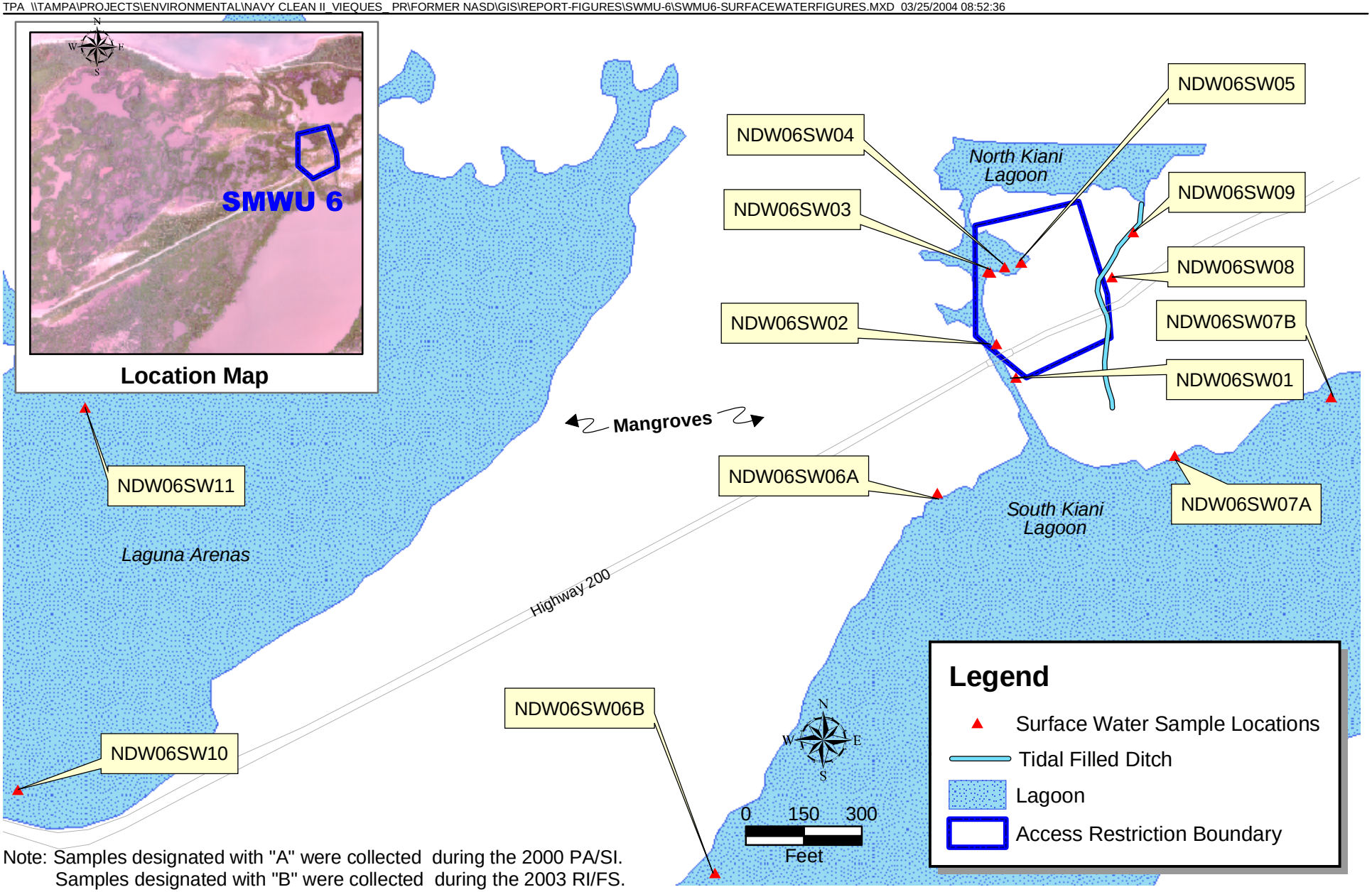
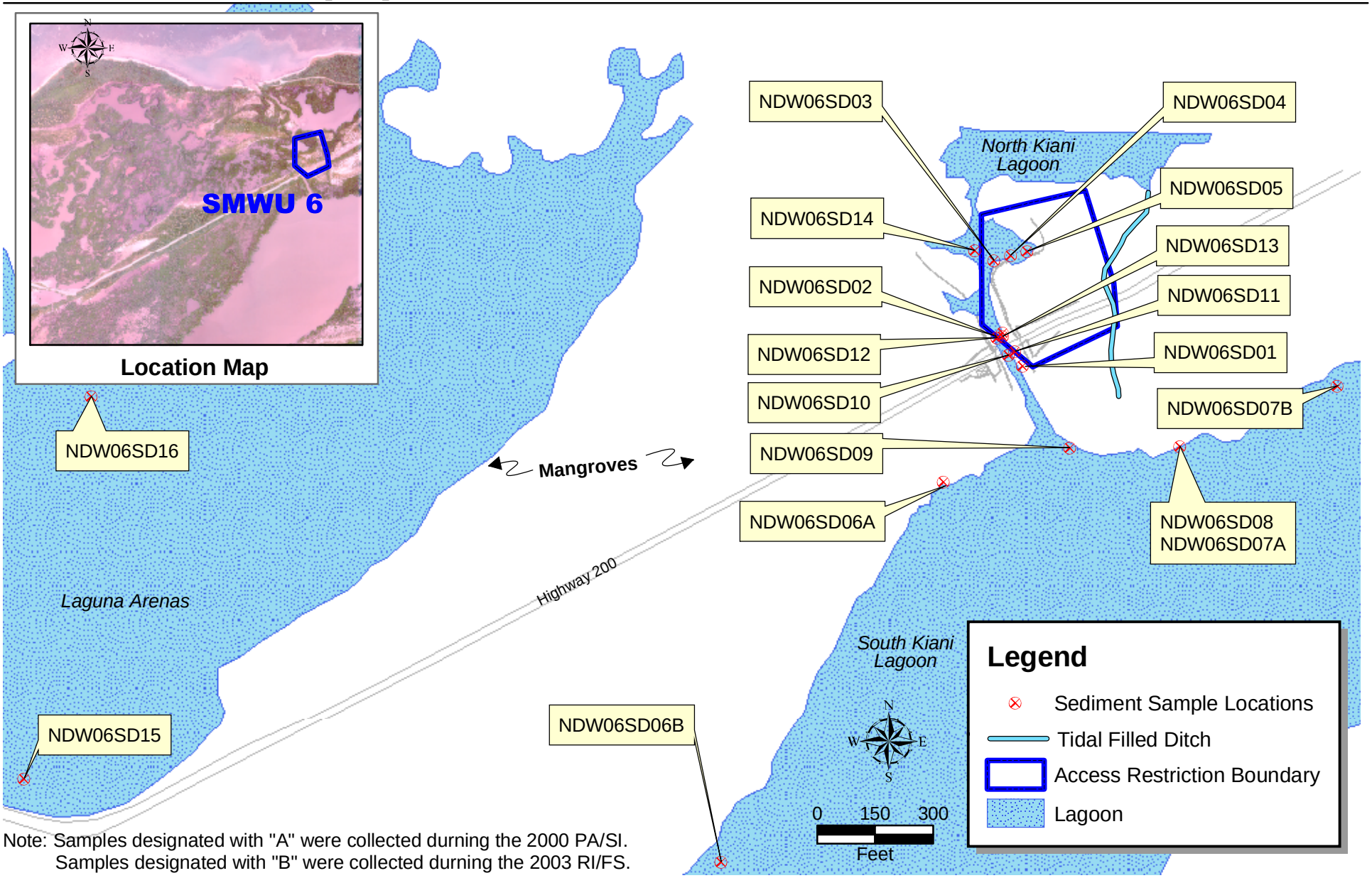


FIGURE 3-3
Remedial Investigation Monitoring Well Location Map
SWMU 6, Former NASD, Vieques, Puerto Rico



Note: Samples designated with "A" were collected during the 2000 PA/SI.
Samples designated with "B" were collected during the 2003 RI/FS.

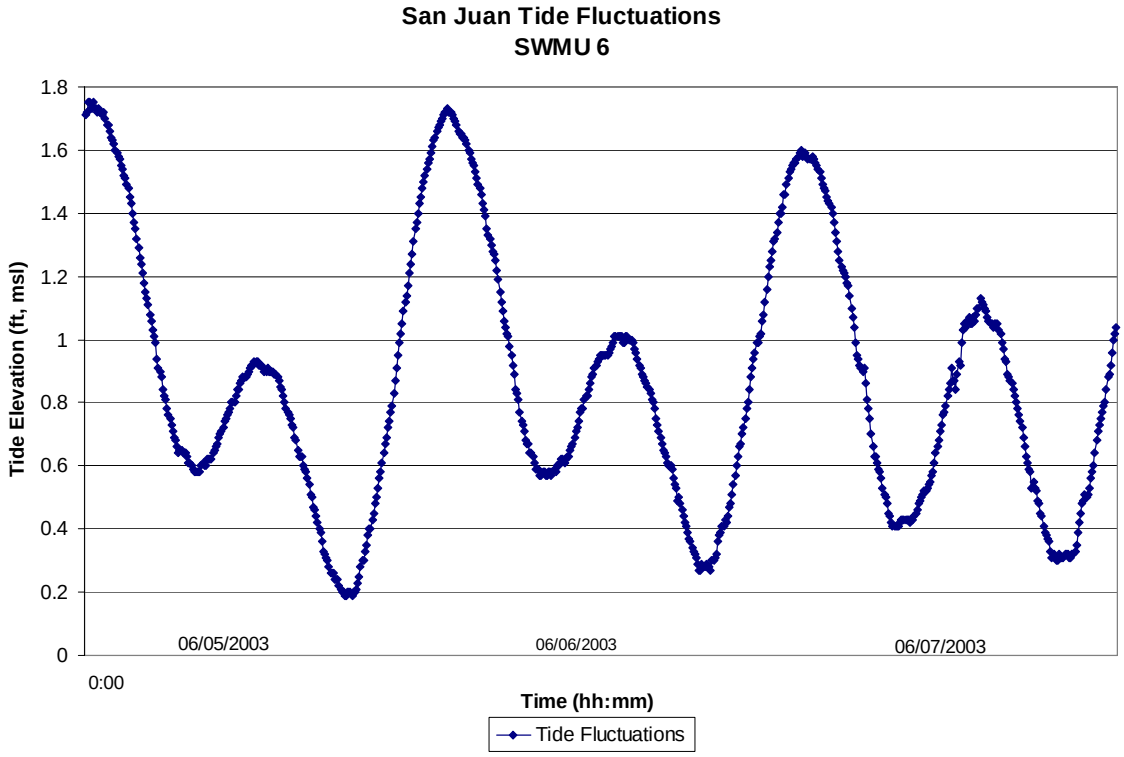
FIGURE 3-4
Remedial Investigation Surface Water Location Map
SWMU 6, Former NASD, Vieques, Puerto Rico

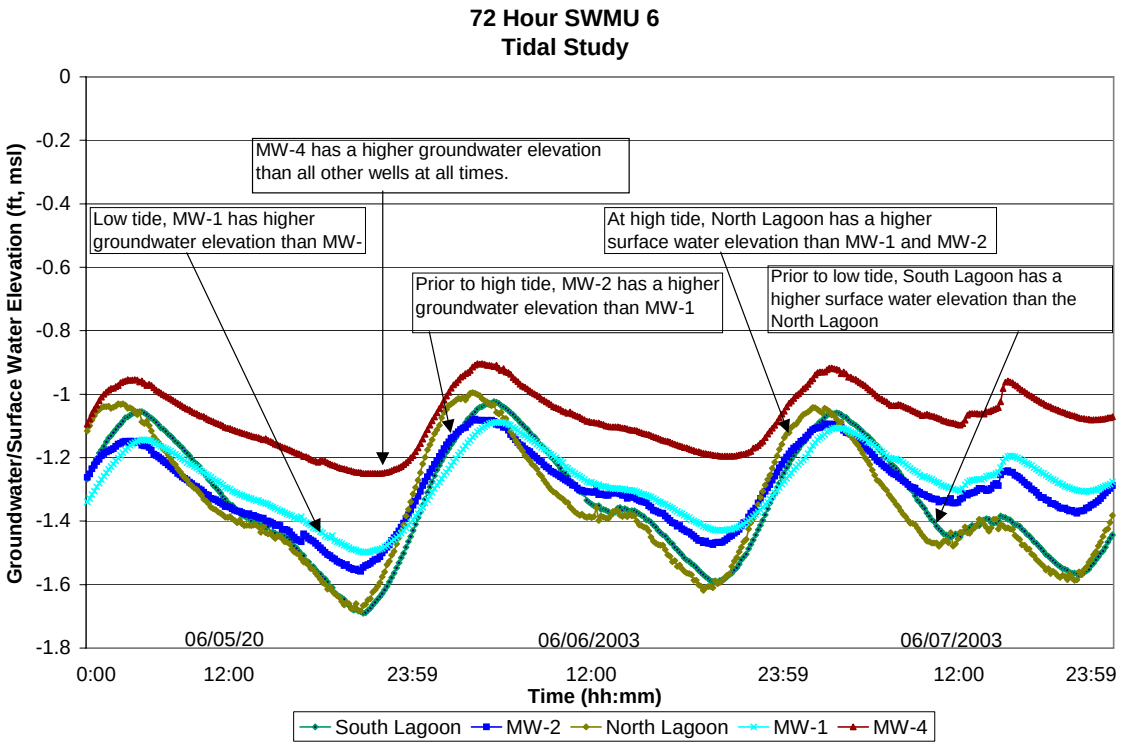


Note: Samples designated with "A" were collected durning the 2000 PA/SI.
Samples designated with "B" were collected durning the 2003 RI/FS.

FIGURE 3-5
Remedial Investigation Sediment Location Map
SWMU 6, Former NASD, Vieques, Puerto Rico

FIGURE 3-6
Tidal Study
SWMU 6, Former NASD





SECTION 4

Nature and Extent of Contamination

This section presents a discussion of the nature and extent of contamination in the soil, groundwater, surface water, and sediment at SWMU 6. The discussion of SWMU 6 results is divided into two parts. First, Section 4.1 summarizes the management and evaluation of laboratory analytical data for the site and media sampled. Section 4.2 then discusses the results of the sampling activities for each medium at the site. The results of the site-specific background groundwater sample, surface water sample, sediment sample, and the soil background results (CH2M HILL, 2002c) are also discussed.

In addition to 2003 RI data, the Expanded PA/SI data are also presented and discussed in this section to characterize more completely the nature and extent of contamination.

A detailed discussion of sampling procedures and other RI activities is presented in Section 3.

It should be noted that the description of the nature and extent of contamination at SWMU 6 is based on the sample distribution from the RI and Expanded PA/SI. Therefore, while the assessment of the nature and extent of contamination described herein may be appropriate for the dataset generated by the samples collected, it is uncertain whether the assessment would be the same if samples had been collected directly through the waste piles. However, this uncertainty will be addressed via the removal action and its associated waste characterization, confirmatory sampling protocol, and residual risk assessment.

4.1 Data Management and Evaluation

This section presents information on the analytical data collected during the RI and the documentation process used to assure data quality. Data tracking and management, from the collection of data in the field through data validation, is also discussed. Non-site-related analytical results are discussed in relation to laboratory contaminants and naturally occurring elements. The screening criteria used in the evaluation of the analytical results also are presented and defined.

4.1.1 Analytical Results Data Quality Evaluation Summary and Conclusions

The analytical data for SWMU 6 were collected in two investigations. The Expanded PA/SI was performed April through June 2000, and the Expanded PA/SI report was finalized in October 2000 and July 2001. The RI was executed from August through October 2003.

The DQEs performed for these two events are presented in the Expanded PA/SI report (CH2M HILL, 2000d). The Expanded PA/SI and RI data were validated by independent contractors Heartland Environmental Services Inc. and Environmental Data Services, respectively, in accordance with EPA Region 2 *Functional Guidelines for Data Review Standard Operating Procedures*. Following this guidance, the DQE included evaluation of the laboratory performance and possible impact on the usability of data due to matrix

interferences. The DQE focused on the usability of the data to support project data interpretation and the decision-making process.

4.1.2 Combined PA/SI and RI DQE

The completeness for these data was calculated to be 98.5 percent (17,069/17,335 total records). Rejections (total of 266 records) were due to the following:

- Sixty-eight volatiles were rejected for low relative response factors.
- Low recoveries of the laboratory control standard (LCS) resulted in 105 nondetect records being rejected.
- Eighty-one records were rejected due to surrogate recoveries less than 10 percent.
- Twelve records were rejected for poor MS/MSD recoveries.

Ambient, equipment, and trip blanks were collected during the field efforts. According to the EPA functional guidelines, concentrations of common organic lab contaminants detected in samples at less than 10 times the concentration associated with blanks can be attributed to field sampling and laboratory contamination rather than environmental contamination from site activities. For other inorganic and organic chemicals, 5 times the concentration detected in the associated blanks is used to qualify results as potential field/laboratory contamination.

Data qualified due to blank contamination consisted of 72 records, including volatile chemicals acetone, methylene chloride, toluene, total xylene, and m,p-xylene. The ubiquitous phthalates from the semivolatile fraction were also present in blanks and elicited qualification; these were bis(2-ethylhexyl) phthalate (BEHP), diethyl phthalate, and di-n-butyl phthalate.

4.1.3 Data Tracking and Validation

The management and tracking of data is the evidentiary portion of the quality assurance process. Custody is assured from the time of field collection to receipt of validated electronic analytical results. Field samples and their required analytical methods were recorded on the chain-of-custody documents, which are included with the data validation reports compiled in Appendix J. Chain-of-custody document entries were verified against the Final RI work plan (CH2M HILL, 2003) to determine if all designated samples were collected and submitted for the appropriate analytical methodologies. Upon receipt of the samples by the laboratory, a comparison to the field information was made to determine if each sample was logged-in and analyzed for the correct methods and target analytes. Additionally, field-specified QC samples annotated on the chain-of-custody documentation were logged-in as part of the specific sample delivery group (SDG). Field QC samples include field blanks, equipment blanks, trip blanks, field duplicates, and matrix spike/matrix spike duplicate (MS/MSD) samples.

RI samples were analyzed by PEL Laboratories of Tampa, Florida. Complete analytical reports are provided as Appendix I. Analytical data reports for the RI were submitted to Environmental Data Services, Inc. (EDS) for third-party data validation. Data reports were submitted in hard copy and electronic versions. Electronic versions were specifically formatted for the capability of automatically downloading data into the EDMS database. Validation procedures established by the National Functional Guidelines for Organic (EPA,

1999a) and Inorganic Analyses (EPA, 2002a), as modified by Region 2, were adhered to during the validation process.

Data that were not within the acceptance limits were appended with a qualifying flag, which consists of a single- or double-letter abbreviation that indicates the nature of the identified nonconformance. The qualifying flags are appended to data records during the database query process, and are included in the final data summary tables. The following primary flags were used to qualify the data:

- "U" indicates that the analyte was not detected and the associated number indicates the approximate sample concentration necessary to be detected.
- "UJ" indicates that the analyte was not detected and the quantitation limit may be inaccurate or imprecise.
- "J" indicates that the analyte is present. Numerical sample results that are greater than the method detection limit (MDL) but less than the laboratory reporting limit (RL) are qualified with a "J" for estimated.
- "=" indicates that the analyte is present. The reported value is the measured concentration.
- "R" indicates an unusable result. The analyte may or may not be present in the sample. Data can be rejected because of matrix interference, dilution of the sample, and other reasons.

4.1.4 Evaluation of Non-Site-Related Analytical Results

Many of the organic and inorganic constituents detected in soil and groundwater at SWMU 6 may be attributed to non-site-related conditions or activities. Non-site-related results include laboratory contaminants and naturally occurring, or background concentrations, of organic and inorganic analytes. A discussion of non-site-related analytical results is provided in the following subsections.

4.1.4.1 Laboratory and Field Sampling Blank Contamination

Four types of blank samples were used to monitor potential contamination introduced during field sampling, sample handling, shipping activities, or sample preparation and analysis in the laboratory. Types of blank samples included:

- **Trip Blank (TB)**: A sample of analyte-free water that is prepared in the laboratory prior to the sampling event. The water is stored in VOC sample containers, which are not opened in the field, and travels back to the laboratory with the other samples for VOC analysis. This blank is used to monitor the potential for sample contamination during the sample container trip. One trip blank was included in each sample cooler that contained samples for VOC analysis. Eleven trip blanks were submitted to the laboratory with these samples.
- **Equipment Rinsate Blank (ERB)**: A sample of the target-free water used for the final rinse during the equipment decontamination process. This blank sample is collected by rinsing the sampling equipment after decontamination and is analyzed for the same

analytical parameters as the corresponding samples. This blank is used to monitor potential contamination caused by incomplete equipment decontamination. One equipment rinsate blank should be collected per day of sampling, per type of sampling equipment. Depending on the method, up to 12 equipment rinsate blanks were submitted to the laboratory for this field effort (RI sampling for all four sites).

- **Field Blank or Ambient Blank (FB or AB)**: The field blank is an aliquot of the source water used for equipment decontamination. This blank monitors contamination that may be introduced from the water used for decontamination. One field blank should be collected from each source of decontamination water and analyzed for the same parameters as the associated samples. Up to five field blanks were collected during this sampling event, depending on the method.

- **Laboratory Method Blank or Method Blank (MB)**: A laboratory method blank is ASTM Type II water that is treated as a sample in that it undergoes the same analytical process as the corresponding field samples. Method blanks are used to monitor laboratory performance and contamination introduced during the analytical procedure. One method blank was prepared and analyzed for every 20 samples or per analytical batch, whichever was more frequent.

According to the EPA guidance *Contract Laboratory Program National Functional Guidelines* (NFG), concentrations of common organic contaminants detected in samples at less than 10 times the concentration of the associated blanks can be attributed to field sampling and/or laboratory contamination rather than environmental contamination from site activities. Common organic contaminants include metals, VOCs (e.g., acetone, methylene chloride, and 2-butanone), and the phthalates. For all inorganic and the other organic contaminants, 5 times the concentration detected in the associated blanks is used to qualify results as potential field and/or laboratory contamination rather than environmental contamination. These rules were applied on a SDG-by-SDG basis and not globally. Additionally, many results reported in blanks (especially metals) are well below a defined practical quantitation limit (PQL) and may represent Type I errors when associated with a matrix. A Type I (or alpha) error occurs when the value reported is dismissed as a biased high, or false positive.

The perchlorate was analyzed using EPA analytical method 314.0 for groundwater perchlorate analysis is recommended for drinking water analysis, and the results are reliable at concentrations greater than 4 µg/L. This method is unreliable for other matrixes such as soils and groundwater at low concentrations; confirmation is recommended for any detection by an alternative analytical method (DoD, 2004). It is important to note that perchlorate is found in several commonly used laboratory detergents (see internal email from analytical lab STL, 2003, Appendix J). In June 2000, four SWMU 6 groundwater samples and one duplicate were analyzed for perchlorate by EPA Method 314.0. Perchlorate was not detected; however, the reporting limit was 40 µg/L. In September 2003, nine Site 6 groundwater samples and one duplicate were analyzed for perchlorate using a reporting limit of 20 µg/L. Perchlorate was reported at 12.8 µg/L in the sample collected from MW01. Based on the DoD recommendation to confirm detections of perchlorate by an alternative analytical method (DoD, 2004), two groundwater samples and two duplicates from MW01 were collected in February 2004 for simultaneous analysis by 314.0 and SW846 Method 8321A. The reporting limit for the 8321A method was 2 µg/L, an order of

magnitude lower than the 314.0 method as a result of more sensitive instrumentation. Perchlorate was not detected in any of the four samples. Therefore, MW01 has been sampled multiple times for perchlorate, which was detected in only one of the samples using the method suspected of producing false positives. Confirmation sampling by both the same method and also the more sensitive method demonstrates that the single detect is likely to be a false positive result.

Many metals are ubiquitous at low levels (aluminum, barium, chromium, copper, calcium, iron, lead, magnesium, manganese, nickel, mercury, potassium, sodium, and zinc). Other metals such as antimony, cobalt, beryllium, selenium, thallium, vanadium, cadmium, and silver are not common contaminants and generally are quantitated just above the MDL. Instrument noise at this level coupled with the matrix effects may elicit Type I errors for these metals at these levels.

As presented in Exhibit 4 of Appendix J, five VOCs detected in blanks resulted in qualification of field samples. Acetone and methylene chloride were detected in all blank types, resulting in 18 and 3 records qualified as nondetect due to blank contamination, respectively. Acetone and methylene chloride are extraction solvents and are common laboratory contaminants. Total xylene, m,p-xylene, and toluene were detected at mostly sub-part-per-billion levels in all blank types. Five (each) records of total xylene and m,p-xylene were qualified as nondetect. Blank contamination resulted in 12 toluene records qualified as non-detect.

Phthalates are plasticizers and common contaminants. The most common phthalates are bis(2-ethylhexyl) phthalate (BEHP), di-n-butylphthalate, and diethyl phthalate. Phthalates are often introduced into samples during handling. Gloves are often used when handling sampling equipment such as pumps, hoses, split spoons, dredges, and bailers. Additionally, laboratory chemists use gloves when handling samples and extracts. Gloves are coated with plasticizers such as BEHP to facilitate release of the gloves from the skin. Three phthalate compounds were reported in ambient, equipment, and laboratory blanks. These compounds were bis(2-ethylhexyl) phthalate (BEHP), diethyl phthalate, and di-n-butyl phthalate. Four diethyl phthalate records, 24 BEHP records, and a single di-n-butyl phthalate record were qualified as nondetect due to blank contamination.

4.1.2.2 DQE Summary and Conclusions

Conclusions from the DQE include:

- The laboratory analyzed the samples according to the EPA methods stated in the work plan, as demonstrated by the deliverable summaries and analytical run sequences.
- Sample results for metals above the MDL but less than the RL may be attributed to instrument noise and/or low level contamination rather than site-related activities and as such may be false positives.
- Sample results for target organic compounds above the MDL but less than the RL should be considered as uncertain but indicative of the presence of that compound at an estimated concentration.
- Sixty-eight volatile records were rejected for low relative response factors.

- Low recoveries resulted in 105 nondetect records being rejected.
- Eighty-one records were rejected due to surrogate recoveries less than 10%.
- Twelve records were rejected for poor MS/MSD recoveries.
- Spike recoveries, surrogates, and field duplicate sample results (other than the exceptions documented in the text and attachments) indicate that the specific sample matrix did not significantly interfere with the analytical process or the final numerical result.

The project objectives for precision, accuracy, representativeness, completeness, and comparability (PARCCs) were met, and the data can be used in the project decision-making process as qualified by the DQE process.

4.1.4.2 Background Conditions

Environmental media samples were collected and analyzed to evaluate background, or native soil, conditions at the NASD. The data from these samples were evaluated to statistically calculate basewide background concentrations for soil, groundwater, surface water, and sediment. Background concentrations were calculated for inorganic analytes only. Section 4.2.1 presents the basewide background data for soil.

Site-specific background samples were collected for groundwater, surface water, and sediment at SWMU 6. Background concentrations were determined from upgradient sample locations. This was not done on a statistical basis. The site-specific background data are also discussed in Section 4.2.1 for each sampled medium at SWMU 6.

4.1.5 Regulatory, Health-Based, and Ecological Screening Levels

Analytical results for all media were compared against common regulatory, human health-based, or ecological standards or criteria. Overall, 10 different sets of standards or criteria were utilized. The screening levels are identified below, according to each medium.

- *Surface soil* results were compared to the EPA Region 9 residential risk-based concentrations (preliminary remediation goals [PRGs]) adjusted to a hazard index (HI) of 0.1 for noncarcinogenic chemicals, the EPA Region 9 leachability criteria for soil (Soil Screening Level [SSL] based on a dilution attenuation factor [DAF] of 10), and appropriate ecological screening criteria. The ecological screening criteria were the most conservative values derived from either *Toxicological benchmarks for screening contaminants of potential concern for effects on soil and litter invertebrates and heterotrophic process* (Efroymson et al., 1997a) or *Toxicological benchmarks for screening contaminants of potential concern for effects on terrestrial plants* (Efroymson et al., 1997b). In some instances where soil screening values were not available from these primary sources, three other references were consulted, including the Canadian protocol for deriving environmental soil quality guidelines (SQGs; CCME, 1996), Dutch Soil Quality Standards (MHSPE, 1994), and U.S. Fish and Wildlife Service (USFWS) soil screening values presented by Beyer (1990). The lowest screening value from these three sources was selected for screening.

- *Subsurface soil* results were compared to the EPA Region 9 leachability criteria for soil (SSL [DAF = 10]).
- *Groundwater* results were compared to EPA Region 9 tap-water PRGs, adjusted to an HI of 0.1.
- *Surface water* results were compared to the lower of either the EPA National Recommended Water Quality Criteria: 2002 or the PREQB Water Quality Standards.
- *Sediment* results were compared to screening values presented in either *Incidence of adverse biological effects within ranges of chemical concentrations in marine and estuarine sediments* (Long, 1995) or the EPA memorandum *Amended Guidance on Ecological Risk Assessment at Military Bases: Process Considerations, Timing of Activities, and Inclusion of Stakeholders* (EPA, 2000a).

These screening levels are conservative screening values, based on human health or ecological risk factors.

Brief explanations of the screening levels are provided below.

- Region 9 Preliminary Remediation Goals (PRGs) for Residential Surface Soil, Tap-water, and Soil Screening Levels (October 2002) -- The criteria presented in the Region 9 PRG table correspond to a systemic hazard quotient of 1.0 or a lifetime cancer risk of 10E-6 (1 additional cancer case per 1 million people). For screening purposes, the PRGs were adjusted to correspond to a systemic hazard quotient of 0.1 to account for an exposure to multiple constituents on the same target organ. The risk-based concentrations are developed using protective default exposure scenarios recommended by EPA (1991) and the best available reference doses and carcinogenic potency slopes. In the absence of Puerto Rico regulatory standards for soil, these criteria are commonly used as a basis of comparison for the nature and extent of soil contamination. They also provide a solely health-based level of comparison for potable water at the point of use. The SSL for protection of groundwater provides soil concentrations that are generally considered to be protective of shallow groundwater. Soil concentrations above the SSL may pose a leaching hazard. However, the size of the affected area and the soil characteristics can have a significant impact on the potential for contaminants to migrate from soil to groundwater. As noted above, an SSL at a DAF of 10 was used for comparison to soil constituent concentrations. Because the DAF is dependent on such site-specific soil characteristics as bulk density, moisture content, organic carbon content, porosity, and pH, there is uncertainty whether an SSL based on a DAF of 10 is appropriate for the site. However, because waste disposal at the site took place between 30 and 40 years ago, and because groundwater occurs at very shallow depths (i.e., 1 to 2 feet), the groundwater constituent concentrations measured during the RI are very likely more representative of any leaching that has or is occurring than the predictive nature of the SSLs. Further, the removal action will include confirmatory sampling to ensure residual media concentrations are acceptable.
- Toxicological benchmarks for screening contaminants of potential concern for effects to soil invertebrates and microbial processes were taken from Efroymson et al. (1997a) and for terrestrial plants from Efroymson et al. (1997b).

The Oak Ridge National Laboratory has identified soil screening values specific to soil invertebrates and microbial processes (Efroymson et al., 1997a) and terrestrial plants (Efroymson et al., 1997b). The soil benchmarks for invertebrates were derived using the National Oceanic and Atmospheric Administration (NOAA) effects range-low (ERL) approach (Long and Morgan, 1990), supported by information from field and laboratory studies, bibliographic databases, and the published literature. Lowest Observed Effect Concentrations (LOECs) were rank-ordered, and a value was selected that most closely approximated the 10th percentile of the distribution. If fewer than 10 values were available, the lowest No Observed Effect Concentration (NOEC) was used. If 10 or more values were available, the 10th percentile was used. Values for plant benchmarks were derived in the same way as for invertebrates and microbial processes (Efroymson et al., 1997b).

In the absence of Oak Ridge National Laboratory soil screening values, alternate screening values were selected from the following references:

Evaluating soil contamination (Beyer, 1990) -- One of the earliest compilations of soil screening values was presented by Beyer (1990) of the USFWS. Screening levels from the Netherlands were taken from the interim Dutch Soil Cleanup Act values issued in the 1980s, which identified three categories: (1) Category A refers to background concentrations in soil or detection limits; (2) Category B refers to moderate soil contamination that requires additional study; and (3) Category C refers to threshold values that require immediate cleanup.

A Protocol for the Derivation of Environmental and Human Health Soil Quality Guidelines, Canadian Council of Ministers of the Environment (CCME, 1996) -- The Canadian protocol for deriving environmental SQGs takes into consideration levels of ecological protection, endpoints, availability of soil toxicity data, receptor arrays, and exposure pathways for four types of land use. In 1997, the CCME issued soil quality guidelines for 20 constituents. The guidelines were derived specifically for the protection of ecological receptors in the environment or for the protection of human health associated with agricultural, residential/parkland, commercial, and industrial land use types. The land use most closely associated with ecological resources was agricultural.

Dutch Soil Quality Standards, 1994 -- The Dutch government issued three categories of soil quality values: target values, sum of the target value and intervention value divided by 2, and intervention values. The target values indicate the soil quality required for sustainability or, expressed in terms of remedial policy, the soil quality required for the full restoration of the soil's functionality for human, animal, and plant life. Target values were based on standards for drinking water and surface waters.

4.1.6 Data Presentation

Complete analytical results for all media are presented in Appendix I. Appendix I also contains summary detects tables for all media sampled. Data validation reports are included in Appendix J. Within the text, data are summarized within groups of samples that represent the various media (surface soil, subsurface soil, groundwater, surface water, and sediment) at SWMU 6. The data are presented in tables for the detected concentrations that exceed a screening criterion for each parameter for each group of samples. For inorganic chemicals that also occur in the background, concentrations exceeding the screening

criterion and the background levels are included in the tables for each sample and the detected chemical. Tables summarizing the maximum and minimum concentrations, along with the detection frequency, for chemicals exceeding screening criteria (and background levels for inorganic chemicals) are also provided. In addition, figures are presented that illustrate detected concentrations of only those parameters that exceed their respective screening criteria and their background concentrations for inorganic chemicals.

4.2 Analytical Results

4.2.1 Basewide Background

This section presents basewide background data that are being used to evaluate background conditions in the various media at SWMU 6. Two sources exist for background concentrations: basewide background concentrations developed on a regional basis and results from site-specific background samples. Basewide background concentrations were evaluated for soil, groundwater, surface water, and sediment (CH2M HILL, 2002c) for the western portion of the former NASD. The project team agreed to use only the basewide soil background concentrations for soil comparisons. Site-specific background samples were collected for groundwater (NDW06GW07 and NDW06GW08), surface water (NDW06SW10 and NDW06SW11), and sediment (NDW06SD15 and NDW06SD16) at SWMU 6. The results from these site-specific background samples are also presented in this section.

4.2.1.1 Background Surface Soil

A previous report (CH2M HILL, 2002c) included an evaluation of 26 surface and 11 subsurface soil samples collected from the western portion of Vieques Island. The purpose was to determine naturally occurring levels of inorganic constituents for use in comparing site data to reasonable background levels. Inorganic background concentrations can be used as reliable indications of the commonly occurring inorganic constituents at the former NASD and can be used to evaluate whether constituents detected during investigations are the result of natural conditions or activities related to historical military operations. If the site inorganic data are below the background concentrations, it can be assumed that these constituents are not related to historical site activities but are more likely from naturally occurring conditions. The background concentrations were presented in Table 4-8 of the background report. The upper tolerance limit (UTL) for the combined soil data was selected as the screening criterion for comparison against individual sample concentrations. Site concentration ranges were compared to background concentration ranges. However, the EPA Region 2 risk assessment process requires that all chemicals detected above risk-based screening criteria be carried through the risk assessment. Therefore, all inorganics detected above human health and ecological receptor protection-based screening criteria were retained as COPCs and carried through the risk assessment process even if the detected concentrations were consistent with background concentrations.

4.2.1.2 Background Groundwater

Background groundwater concentrations were determined on a site-specific basis. At SWMU 6, two monitoring wells (NDW06GW07 and NDW06GW08) were installed as site-specific background monitoring points. Because results were insufficient to perform a statistical evaluation of the data, the maximum detected concentration was used as the

background concentration. A summary of the analytical results from these site-specific background samples is provided in Table 4-1. For comparison purposes, in addition to site-specific background values, the basewide background groundwater inorganic chemicals are also included in Table 4-12.

4.2.1.3 Background Surface Water

Background surface water concentrations were determined on a site-specific basis. At SWMU 6, two surface water samples (NDW06SW10 and NDW06SW11) were collected as site-specific background samples. Because results were insufficient to perform a statistical evaluation of the data, the maximum detected concentration was used as the background concentration. A summary of the analytical results from these site-specific background samples is provided in Table 4-2. Both site-specific background and the base-wide background surface water inorganic chemicals that were detected in two samples are also included in Table 4-13.

4.2.1.4 Background Sediment

Background sediment concentrations were determined on a site-specific basis. At SWMU 6, two sediment samples (NDW06SD15 and NDW06SD16) were collected as site-specific background samples. Because results were insufficient to perform a statistical evaluation of the data, the maximum detected concentration was used as the background concentration. A summary of the analytical results from these site-specific background samples is provided in Table 4-3. Table 4-14 includes background values for both site-specific and base-wide background sediment samples.

4.2.1.5 Essential Human Nutrients

In accordance with EPA guidance, several essential human nutrients were evaluated to determine if they should be further evaluated. *Risk Assessment Guidance for Superfund: Part A* (EPA, 1989b) specifies that essential human nutrients that are present at concentrations that marginally exceed background concentrations and are toxic only at very high doses can be eliminated from further consideration during the initial screening process. To meet these requirements, the percentage of the recommended daily intake was calculated for each essential human nutrient based on soil consumption and the maximum detected concentration in surface soil. Table 4-4 presents the data used in the calculation and the results of the evaluation. This method is considered conservative because the calculation is based on the maximum detected concentration of the essential nutrient and the recommended daily intake rather than a level where adverse effects are observed. The recommended daily intake is the median value (where a range is presented) from the *Recommended Dietary Allowances*, 10th Edition, National Academy of Sciences, National Research Council, Food and Nutrition Board (1989).

As indicated in Table 4-4, daily intake of the essential nutrients calcium, magnesium, potassium, and sodium from soil consumption (based on the maximum soil concentration) generally represents less than 2 percent of the recommended daily intake of these essential nutrients with the exception of calcium, which represents 5.5 percent of a child's recommended daily intake of calcium. Therefore, the maximum concentrations of these essential nutrients are well below toxic levels and these parameters will not be considered further in this RI.

4.2.2 SWMU 6 – Mangrove Disposal Site

The sampling activities conducted at SWMU 6 during the Expanded PA/SI and RI field work in 2000-2003 consisted of surface and subsurface soil sampling; groundwater sampling from permanent wells; surface water sampling; and sediment sampling. The results of these sampling activities and the nature and extent of contamination in the soil and groundwater are discussed in this section.

Tables 4-5 through 4-9 present the detected chemicals above the screening criteria and, for inorganic chemicals, background levels in surface soil, subsurface soil, groundwater, surface water, and sediment, respectively. Summaries of chemicals detected above screening criteria, comparing against criteria and background levels are presented in Tables 4-10 through 4-14 for surface soil, subsurface soil, groundwater, surface water, and sediment, respectively. Appendix I, Table I-2 includes a comparison of all detected chemicals by sample concentrations against screening criteria for each sample for all media.

4.2.2.1 Surface Soil

Results from surface soil samples collected during both the 2000 Expanded PA/SI sampling events and the 2003 RI event are presented and evaluated in this section. Eight surface soil samples (0 to 6 inches bls) were collected during the 2000 Expanded PA/SI. The soil samples were analyzed for metals, VOCs, SVOCs, pesticides, PCBs, and explosives.

Fifteen additional surface soil samples were collected at SWMU 6 during the RI. Surface soil samples were analyzed for metals, VOCs, SVOCs, pesticides, PCBs, explosives, and perchlorate. Appendix I-2 includes a comparison of all detected chemicals by sample concentrations against screening criteria for each sample. Figures 4-1 through 4-3 illustrate the detected concentrations of those parameters that exceed screening criteria and background concentrations in one or more surface soil samples at SWMU 6.

Inorganic Analytes

A total of 23 inorganic analytes were detected in surface soil samples at SWMU 6. Eleven inorganic analytes were detected above screening criteria in at least one surface soil sample. Eight metals (aluminum, antimony, arsenic, iron, lead, manganese, thallium, and vanadium) exceed their respective EPA Region 9 residential PRGs (HI=0.1). Human health-based screening criteria were not available for calcium, magnesium, potassium, and sodium. As previously discussed, these essential human nutrients were not identified as human health COPCs in accordance with EPA guidance (RAGS Part A, EPA, 1989).

Seven metals (antimony, arsenic, copper, iron, lead, thallium, and zinc) exceeded their respective human health or ecological screening criteria in at least one surface soil sample.

Antimony was detected above its leachability criteria in surface soil. Leaching criteria were not available for 12 metals (aluminum, calcium, cobalt, copper, iron, lead, magnesium, manganese, mercury, potassium, sodium, and thallium).

Each of the chemicals that exceed available screening criteria is discussed below. Figure 4-1 graphically shows concentrations of inorganic analytes that were found above screening criteria and background concentrations.

Antimony was detected in 19 of 23 surface soil samples collected at SWMU 6. Two samples contained antimony above its background concentration of 2.2 mg/kg (CH2M HILL, 2002c). One sample contained antimony at a concentration that exceeded its residential PRG and its ecological screening criterion. Two samples were above the SSL.

Arsenic was detected in all 23 surface soil samples collected at SWMU 6. Three concentrations were above the background concentration (2.2 mg/kg, CH2M HILL, 2002c). All 23 samples contained arsenic at concentrations that exceeded its residential PRG. Arsenic was not detected above its ecological screening criterion or SSL at SWMU 6.

Copper was detected in all 23 surface soil samples at SWMU 6. Copper was detected above its background concentration of 68 mg/kg (CH2M HILL, 2002c) in six samples. It was not detected above its residential PRG. Seven samples contained copper above its ecological screening criterion. An SSL was not available for copper.

Iron was detected in all 23 surface soil samples at SWMU 6. Two samples contained iron above its background concentration of 37,531 mg/kg (CH2M HILL, 2002c). All 23 samples contained iron at concentrations that exceed its residential PRG and its ecological screening criterion. An SSL was not available for iron.

Lead was detected in all 23 surface soil samples at SWMU 6. Fifteen samples contained lead above its background concentration of 6.9 mg/kg (CH2M HILL, 2002c). Lead was detected above its residential PRG in one sample, and six samples contained lead above its ecological screening criterion. An SSL was not available for lead.

Thallium was detected in 3 of 23 surface soil samples at SWMU 6. All three samples contained thallium above its background concentration of 0.67 mg/kg (CH2M HILL, 2002c) and its residential PRG. One sample contained thallium above its ecological screening criterion. An SSL was not available for thallium.

Zinc was detected in all 23 surface soil samples at SWMU 6. Ten samples contained zinc above its background concentration of 65 mg/kg (CH2M HILL, 2002c). Zinc was not detected above its residential PRG or its SSL in any sample collected at SWMU 6. Zinc was detected above its ecological screening criterion in 10 samples.

Pesticides

Three pesticides, DDT and its degradation products DDD, and DDE, were detected in surface soil samples at SWMU 6.

DDD was detected in 7 of 23 surface soil samples collected at SWMU 6. DDT was not detected above its residential PRG or SSL but was detected above its ecological screening criterion in four samples.

DDE was detected in 12 of 23 surface soil samples collected at SWMU 6. DDE was not detected above its residential PRG or SSL but was detected above its ecological screening criterion in nine samples.

DDT was detected in 5 of 23 surface soil samples collected at SWMU 6. DDT was not detected above its residential PRG or SSL. All detected concentrations were above its ecological screening criterion.

Semivolatile Organic Compounds

Twenty SVOCs were detected in surface soil samples at SWMU 6. The detected SVOCs consisted of 11 PAHs, carbazole, and bis(2-ethylhexyl)phthalates (see Appendix I-2). Five of the detected SVOCs were above their respective residential PRGs. PRGs were not available for two other SVOCs. Seven of the detected SVOCs were above their respective ecological screening criteria and 10 others did not have ecological screening criteria. Benzo(a)anthracene was the only SVOC to be detected above its SSL. SSLs were not available for six SVOCs.

SVOCs that exceeded available screening criteria are discussed below.

Anthracene was detected in 2 of 23 surface soil samples collected at SWMU 6. Anthracene was not detected above its residential PRG or SSL. It was detected above its ecological screening criterion in one sample.

Benzo(a)anthracene was detected in 5 of 23 surface soil samples collected at SWMU 6. It was detected above its residential PRG and SSL in one sample.

Benzo(a)pyrene was detected in 7 of 23 surface soil samples collected at SWMU 6. It was detected above its residential PRG in five samples and its ecological screening criterion in four samples. An SSL was not available for benzo(a)pyrene.

Benzo(b)fluoranthene was detected in 8 of 23 surface soil samples collected at SWMU 6. Benzo(b)fluoranthene was detected above its residential PRG in one sample. It was not detected above its SSL. An ecological screening criterion was not available for benzo(b)fluoranthene.

Benzo(g,h,i)perylene was detected in 7 of 23 surface soil samples collected at SWMU 6. It was not detected above its residential PRG. One sample contained benzo(g,h,i)perylene above its ecological screening criterion. An SSL was not available for benzo(g,h,i)perylene.

Carbazole was detected in 1 of 23 surface soil samples collected at SWMU 6. The sample contained carbazole above its SSL. It was not detected above its residential PRG. An ecological screening criterion was not available for carbazole.

Dibenz(a,h)anthracene was detected in 3 of 23 surface soil samples collected at SWMU 6. It was detected above its residential PRG in two samples. Dibenz(a,h)anthracene was not detected above its SSL. An ecological screening criterion was not available for dibenz(a,h)anthracene.

Fluoranthene was detected in 7 of 23 surface soil samples collected at SWMU 6. It was not detected above its residential PRG or SSL. It was detected above its ecological screening criterion in four samples.

Indeno(1,2,3-c,d)pyrene was detected in 6 of 23 surface soil samples collected at SWMU 6. It was detected above its residential PRG in two samples. Indeno(1,2,3-c,d)pyrene was not detected above its SSL. An ecological screening criterion was not available for indeno(1,2,3-c,d)pyrene.

Naphthalene was detected in 1 of 23 surface soil samples collected at SWMU 6. Naphthalene was not detected above its residential PRG or SSL but was detected above its ecological screening criterion.

Phenanthrene was detected in 4 of 23 surface soil samples collected at SWMU 6. A human health screening criterion and SSL were not available for phenanthrene. Two samples contained phenanthrene above its ecological screening criterion.

Pyrene was detected in 9 of 23 surface soil samples collected at SWMU 6. Pyrene was not detected above its residential PRG or SSL but was detected above its ecological screening criterion in four samples.

Volatile Organic Compounds

Seven VOCs were detected in the surface soil samples collected at SWMU 6 (see Appendix I-2). VOCs were not detected above health-based screening criteria, available ecological screening criteria, or available SSLs. Ecological screening criteria were not available for six of the detected VOCs, and an SSL was not available for methyl ethyl ketone.

Polychlorinated Biphenyls

One PCB (Aroclor-1254) was detected in one surface soil samples collected at SWMU 6. It was not detected above available screening criteria.

Explosives

Explosives were not detected in surface soil samples at SWMU 6.

Perchlorate

Perchlorate was not detected in surface soil samples at SWMU 6.

In summary, the chemicals identified above screening criteria are those listed in Table 4-5 and presented in Figures 4-1 to 4-3. The chemicals are mostly inorganic chemicals, PAHs, and chlorinated pesticides DDT, DDD, and DDE.

4.2.2.2 Subsurface Soil

Results from subsurface soil samples collected during the 2000 Expanded PA/SI sampling event are presented and evaluated in this section. Eight subsurface soil samples were collected during the 2000 Expanded PA/SI. The soil samples were analyzed for metals, VOCs, SVOCs, pesticides, PCBs, and explosives.

Subsurface soil samples were not collected at SWMU 6 during the RI because the water depth was approximately 1 foot. Table 4-6 presents a summary of the detected concentrations and exceedances of each compound for the SWMU 6 subsurface soil samples. Table 4-11 presents statistical summaries of those chemicals that exceed available screening criteria. Figure 4-4 presents the detected concentrations of chemicals that exceed screening criteria and background concentrations.

Inorganic Analytes

A total of 23 inorganic analytes were detected in subsurface soil samples at SWMU 6 (see Appendix I, Table I-2). Leaching criteria were not available for 12 metals (aluminum,

calcium, cobalt, copper, iron, lead, magnesium, manganese, mercury, potassium, sodium, thallium).

Of the 12 inorganic chemicals without SSLs, aluminum, calcium, cobalt, iron, magnesium, manganese, and sodium were not detected above their respective background concentrations. Table 4-6 presents only antimony, as this is the only inorganic chemical detected above screening criteria and background levels.

Antimony was detected in all eight subsurface soil samples. Antimony was detected above its SSL and background concentration of 2.3 mg/kg (CH2M HILL, 2002c) in one subsurface soil sample.

Semivolatile Organic Compounds

Eleven SVOCs were detected in subsurface soil at SWMU 6. SVOCs were not detected above available screening criteria (SSLs). SSLs were not available for three SVOCs.

Volatile Organic Compounds

Seven VOCs (benzene, carbon disulfide, ethylbenzene, methyl ethyl ketone, tetrachloroethene [PCE], toluene, and xylenes) were detected in subsurface soil samples at SMMU 6. None of the detected VOCs exceeded their respective SSLs. An SSL was not available for methyl ethyl ketone. It was detected in one subsurface soil sample.

Explosives

Explosives were not detected in subsurface soil at SWMU 6.

Pesticides

DDD, DDE, and DDT were detected in subsurface soil at SWMU 6. However, the detected concentrations were all below their respective SSLs.

In summary, the only chemical identified as exceeding screening criteria and background is antimony, as presented in Table 4-6 and Figure 4-4.

4.2.2.3 Groundwater

Four monitor wells were installed and sampled as part of the Expanded PA/SI. The samples were analyzed for total and dissolved metals, VOCs, SVOCs, PCBs, pesticides, explosives, and perchlorate.

During the RI, samples were collected from the existing monitor wells. Four additional monitor wells were also installed and sampled. Groundwater samples were analyzed for total and dissolved metals, SVOCs, VOCs, PCBs, pesticides, explosives, and perchlorate. Two of the monitor wells (NDW06GW07 and NDW06GW08) were installed upgradient of the site as site-specific background wells. The details of this sampling are presented in Section 3. Table 4-7 presents the organic chemicals detected at concentrations above screening criteria, and inorganic chemical concentrations above background and screening criteria for each chemical in SWMU 6 groundwater samples. Table 4-12 presents the statistical summaries of chemicals that exceed their respective screening criteria. Figures 4-5 and 4-6 illustrate the detected concentrations of those parameters that exceed background and applicable screening criteria.

Inorganic Analytes

A total of 23 inorganic analytes were detected in unfiltered groundwater samples. Nineteen inorganic analytes were detected in filtered samples. Nine metals (antimony, arsenic, barium, cadmium, iron, manganese, selenium, silver, and thallium) were detected above screening criteria in non-filtered (total metals) samples. Seven metals were detected above their respective EPA Region 9 tap-water PRGs in filtered samples: antimony, arsenic, barium, cadmium, iron, manganese, and selenium. Screening criteria were not available for calcium, chromium, lead, magnesium, potassium, and sodium.

Antimony was detected above screening criteria and background in 4 of 10 unfiltered and no filtered groundwater samples collected at SWMU 6. All detections of antimony (filtered and unfiltered) exceeded the tap-water PRG.

Arsenic was detected in 8 of 10 unfiltered and 8 of 10 filtered groundwater samples collected at SWMU 6. Detected concentrations were all above the tap-water PRG.

Cadmium was detected in 6 of 10 unfiltered and 4 of 10 filtered groundwater samples collected at SWMU 6. Except for one filtered sample, all detected concentrations were above the tap-water PRG.

Chromium was detected in 6 of 10 unfiltered and 7 of 10 filtered groundwater samples collected at SWMU 6. Three unfiltered and two filtered samples were above the water PRG. Two unfiltered and one filtered samples contained chromium above the background concentrations (16.2 µg/L, unfiltered and 19.3 µg/L, filtered).

Iron was detected in 7 of 10 unfiltered and 4 of 7 filtered groundwater samples collected at SWMU 6. One unfiltered sample was above the tap-water PRG and background.

Lead was detected in 9 of 10 unfiltered and 7 of 10 filtered groundwater samples collected at SWMU 6. All of the detected concentrations were above the background concentrations because lead was not detected in the background samples from the upgradient wells. A tap-water PRG was not available for lead. Lead concentrations were compared to the EPA treatment technique action level (TTAL, Drinking Water Standards and Health Advisories, 2000) of 15 µg/L. Six unfiltered and three filtered samples were above the TTAL.

Selenium was detected in 9 of 10 unfiltered and 6 of 10 filtered groundwater samples collected at SWMU 6. Five unfiltered and three filtered samples contained selenium above its tap-water PRG and its site-specific background concentrations (76.7 µg/L unfiltered and 98.6 µg/L filtered).

Silver was detected in 3 of 10 unfiltered and 2 of 10 filtered groundwater samples collected at SWMU 6. One unfiltered samples contained silver above its tap-water PRG. Silver was not detected in the site-specific background samples.

Thallium was not detected in any of the filtered samples collected from SWMU 6. Thallium was detected in 2 of 10 unfiltered samples, with the reported concentrations exceeding the tap-water PRG. Thallium was not detected in the site-specific background samples.

Volatile Organic Compounds

Chloroform was detected in two groundwater samples collected from SWMU 6. One sample contained chloroform above its tap-water PRG.

Semivolatile Organic Compounds

Four SVOCs were detected in the groundwater samples collected from SWMU 6. None of the detected SVOCs were above their respective tap-water PRGs.

Pesticides

Pesticides were not detected in any of the groundwater samples collected from SWMU 6.

Polychlorinated Biphenyls

Two PCBs, Aroclor-1221 and Aroclor-1232, were detected above screening criteria in the groundwater samples collected from SWMU 6. They were both detected in the same sample collected in 2000. PCBs were not detected in the same well during the 2003 sampling effort.

Explosives

Explosives were not detected in any of the groundwater samples collected from SWMU 6.

Perchlorate

Perchlorate was detected in one groundwater sample collected from SWMU 6. In June 2000, four SWMU 6 groundwater samples and one duplicate were analyzed for perchlorate by EPA Method 314.0. Perchlorate was not detected; however, the reporting limit was 40 µg/L. In September 2003, nine Site 6 groundwater samples and one duplicate were analyzed for perchlorate using a reporting limit of 20 µg/L. Perchlorate was detected at an estimated concentration of 12.8 J µg/L in well MW01, above its EPA Region 9 PRG of 0.365 µg/L. Because the analytical method for perchlorate is prone to false positive results (DoD, 2002), the well was resampled in February 2004 (two samples and two duplicates) for simultaneous analysis by 314.0 and SW846 Method 8321A, as recommended by DoD (2004). The reporting limit for the 8321A method was 2 µg/L, an order of magnitude lower than the 314.0 method as a result of more sensitive instrumentation. Perchlorate was not detected in any of the four samples.

In summary, several organic and inorganic chemicals were detected above the background levels and tap-water PRGs, as presented in Tables 4-7 and 4-12 and Figure 4-5. The organic chemicals include chloroform in one well. Other organic chemicals were detected in 2000 sampling and have not been detected in 2003 sampling.

4.2.2.4 Surface Water

During the Expanded PA/SI, seven surface water samples were collected and analyzed for metals, VOCs, SVOCs, PCBs, pesticides, and explosives. None of the samples were filtered. During the RI, nine additional surface water samples were collected and analyzed for total and dissolved (filtered) metals, VOCs, SVOCs, PCBs, pesticides, explosives, and perchlorate. Five surface water sample locations (NDW06SW02, NDW06SW03, NDW06SW05, NDW06SW06, and NDW06SW07) were resampled at previously sampled locations and the station identification numbers were the same for the 2000 and 2003 sampling efforts. Two of the RI surface water samples (NDW06SW10 and NDW06SW11) were collected as site-specific background samples. The details of this sampling are presented in Section 3. Table 4-8 presents the exceeded concentrations for inorganic chemicals above background and screening criteria for each chemical in SWMU 6 surface water samples. Table 4-13 presents the statistical summaries of chemicals that exceed the screening criteria. Figure 4-7

illustrates the detected concentrations of those parameters that exceed available screening criteria and their background concentrations in surface water.

Analytical results from the surface water samples were compared to appropriate ecological screening criteria and the results of the comparison are presented below.

Inorganic Analytes

Twenty inorganic chemicals were detected in site surface water samples (see Table 4-8). Four inorganic chemicals (arsenic, copper, mercury, and silver) exceeded their respective ecological screening criteria in the unfiltered samples. Nickel was detected above its screening criterion in filtered samples. Screening criteria were not available for 11 other inorganic chemicals.

Arsenic was detected in 3 of 14 unfiltered surface water samples at SWMU 6. It was not detected in any of the seven filtered samples. The detected concentrations exceeded the ecological screening criterion. Arsenic was not detected in the site-specific background samples.

Copper was detected in 7 of 14 unfiltered surface water samples at SWMU 6. It was not detected in any of the seven filtered samples. Four unfiltered samples exceeded the ecological screening criterion. Copper was not detected in the site-specific background samples.

Lead was detected in 4 of 14 unfiltered surface water samples at SWMU 6. It was not detected in any of the seven filtered samples. One sample exceeded the ecological screening criterion. Lead was not detected in the site-specific background samples.

Mercury was detected in seven of eight unfiltered and six of seven filtered surface water samples at SWMU 6. One sample exceeded the ecological screening criterion. One unfiltered and one filtered sample contained mercury above its site-specific background concentrations (0.04 µg/L, unfiltered and 0.0561 µg/L filtered).

Silver was detected in 1 of 14 unfiltered surface water samples at SWMU 6. It was not detected in any of the seven filtered samples. The single detection of silver exceeded the ecological screening criterion. Silver was not detected in the site-specific background samples.

Volatile Organic Compounds

VOCs were not detected in any surface water samples collected at SWMU 6.

Semivolatile Organic Compounds

Two SVOCs, diethyl phthalate and di-n-octylphthalate, were detected in surface water samples collected at SWMU 6. These are also common laboratory contaminants, as previously discussed. An ecological screening criterion was not available for di-n-octylphthalate. It was detected in 1 of 14 samples.

Polychlorinated Biphenyls

PCBs were not detected in any surface water samples collected at SWMU 6.

Pesticides

Pesticides were not detected in any surface water samples collected at SWMU 6.

Explosives

Explosive compounds were not detected in any surface water samples collected at SWMU 6.

Perchlorate

Perchlorate was not detected in any surface water sample collected at SWMU 6.

In summary, several inorganic chemicals were identified as exceeding screening criteria for surface water (see Tables 4-8 and 4-13 and Figure 4-7).

4.2.2.5 Sediment

During the Expanded PA/SI, seven sediment samples were collected and analyzed for metals, VOCs, SVOCs, PCBs, pesticides, and explosives. During the RI, 14 additional sediment samples were collected and analyzed for metals, VOCs, SVOCs, PCBs, pesticides, explosives, and perchlorate. Five sediment samples (NDW06SD02, NDW06SD03, NDW06SD05, NDW06SD06, and NDW06SD07) were collected at previously sampled locations and the station identification numbers were the same as for the 2000 and 2003 sampling efforts. Two of the RI sediment samples (NDW06SD15 and NDW06SD16) were collected as site-specific background samples. The details of this sampling were presented in Section 3. Appendix I, Table I-2 presents the detected concentrations, screening criteria, and exceedances of each chemical in SWMU 6 sediment samples. Table 4-9 presents the organic chemicals detected above screening criteria and inorganic chemicals detected above screening criteria and background by chemical in each sample. Table 4-14 presents the statistical summaries of chemicals that exceed their respective screening criteria. Figures 4-8 and 4-9 illustrate the detected concentrations of those parameters that exceed available screening criteria and the background concentrations for inorganic chemicals.

Analytical results from the sediment samples were compared to appropriate ecological screening criteria, and the results of the comparison are presented below.

Inorganic Analytes

Twenty-three inorganic chemicals were detected in site sediment samples (see Appendix I-2). Antimony, arsenic, barium, cadmium, copper, lead, mercury, nickel, silver, and zinc exceeded their respective ecological screening criteria.

Antimony was detected in 15 of 19 sediment samples. One sample contained antimony at a concentration that exceeded its ecological screening criterion. Nine samples exceeded the site-specific background concentration (0.59 mg/kg).

Arsenic was detected in all 19 sediment samples. Three samples contained arsenic at concentrations that exceed its ecological screening criterion and 17 samples contained arsenic at concentrations that exceed its site-specific background concentration (1.5 mg/kg).

Barium was detected in all 19 sediment samples. One sample contained barium at a concentration that exceeded its ecological screening criterion and its site-specific background concentration (69 mg/kg).

Cadmium was detected in 12 of 19 sediment samples. One sample contained cadmium at a concentration that exceeded its ecological screening criterion, and three samples exceeded its the site-specific background concentration (0.14 mg/kg).

Copper was detected in all 19 sediment samples. Twelve samples contained copper at concentrations that exceeded its ecological screening criterion, and 10 samples exceeded its site-specific background concentration (26 mg/kg).

Lead was detected in all 19 samples with a concentration range of 0.468 mg/kg to 144 mg/kg. Two of the 19 detections were above the sediment screening criteria value of 30.2 mg/kg. The highest concentration was detected at NDW06SD02, located in the canal along the western edge of the site, where several other metals were detected during 2000 sampling (Expanded PA/SI). The resampling of this location in 2003 did not indicate these elevated metals, including the lead concentrations.

Mercury was detected in 14 of 19 sediment samples. Two samples contained mercury at concentrations that exceeded its ecological screening criterion, and six samples exceeded the site-specific background concentration (0.052 mg/kg).

Nickel was detected in all 19 sediment samples. One sample contained nickel at a concentration that exceeded the ecological screening criterion, and 10 samples exceeded the site-specific background concentration (4.1 mg/kg).

Silver was detected in 4 of 19 sediment samples. One sample contained silver at a concentration that exceeded the ecological screening criterion and the site-specific background concentration (0.3 mg/kg).

Zinc was detected in all 14 sediment samples. Two samples contained zinc at concentrations that exceeded the ecological screening criterion, and seven samples exceeded the site-specific background concentration (48 mg/kg).

Volatile Organic Compounds

Seven VOCs (acetone, carbon disulfide, ethylbenzene, methyl ethyl ketone, methylene chloride, toluene, and xylenes) were detected in sediment samples at SWMU 6. Ecological screening criteria were not available for any of the detected VOCs.

Semivolatile Organic Compounds

Ten SVOCs were detected in sediment samples collected at SWMU 6. Only bis(2-ethylhexyl)phthalate was detected above its ecological screening criterion in two samples.

Polychlorinated Biphenyls

PCBs were not detected in any sediment samples collected at SWMU 6.

Pesticides

DDD, DDE, and DDT were detected above screening criteria in sediment samples collected at SWMU 6. No other pesticides were detected in SWMU 6 sediment samples.

DDD was detected in 6 of 18 sediment samples. Two samples contained DDD at concentrations that exceeded its ecological screening criterion.

DDE was detected in 5 of 17 sediment samples. Three samples contained DDE at concentrations that exceeded its ecological screening criterion.

DDT was detected in 3 of 18 sediment samples. One sample contained DDT at a concentration that exceeded its ecological screening criterion.

Explosives

Explosive compounds were not detected in any sediment samples collected at SWMU 6.

Perchlorate

Perchlorate was not detected in any sediment samples collected at SWMU 6.

In summary, sediments collected from the water bodies near the site several metals above screening criteria. The detected organic chemicals were not above the available screening criteria.

TABLE 4-1
Analytical Results From Background Groundwater Samples
SWMU 6, Naval Ammunition Support Detachment
SWMU 6 Former NASD, Vieques Island, Puerto Rico

Chemical	Station ID	Concentration Total	Qualifer	Dissolved	Qualifer
Metals (ug/L)					
ALUMINUM	NDW06GW07	875	UJ	875	UJ
	NDW06GW08	700	UJ	700	UJ
ANTIMONY	NDW06GW07	62.5	U	62.5	U
	NDW06GW08	50	U	50	U
ARSENIC	NDW06GW07	51	UJ	51	UJ
	NDW06GW08	40.8	UJ	40.8	UJ
BARIUM	NDW06GW07	147	J	144	J
	NDW06GW08	131	J	124	J
BERYLLIUM	NDW06GW07	3.92	J	3.5	J
	NDW06GW08	1.89	U	3.81	J
CADMIUM	NDW06GW07	8.9	U	8.9	U
	NDW06GW08	7.12	U	7.12	U
CALCIUM	NDW06GW07	1120000	=	1150000	=
	NDW06GW08	1090000	=	1060000	=
CHROMIUM, TOTAL	NDW06GW07	19.3	J	16.1	J
	NDW06GW08	16.8	J	16.2	J
COBALT	NDW06GW07	27.2	J	21.5	J
	NDW06GW08	11.5	J	16.3	J
COPPER	NDW06GW07	29.2	U	29.2	UJ
	NDW06GW08	23.4	U	23.4	UJ
IRON	NDW06GW07	418	U	418	U
	NDW06GW08	334	U	334	U
LEAD	NDW06GW07	44	UJ	44	UJ
	NDW06GW08	35.2	UJ	35.2	UJ
MAGNESIUM	NDW06GW07	2550000	=	2640000	=
	NDW06GW08	2180000	=	2140000	=
MANGANESE	NDW06GW07	476	=	483	=
	NDW06GW08	616	=	593	=
MERCURY	NDW06GW07	0.024	J	0.0464	J
	NDW06GW08	0.0288	J	0.0162	UJ
NICKEL	NDW06GW07	24.9	U	24.9	U
	NDW06GW08	19.9	U	19.9	U
POTASSIUM	NDW06GW07	700000	J	686000	J
	NDW06GW08	647000	J	620000	J
SELENIUM	NDW06GW07	76.7	J	98.6	J
	NDW06GW08	42	U	53	J
SILVER	NDW06GW07	11.8	U	11.8	U
	NDW06GW08	9.44	U	9.44	U
SODIUM	NDW06GW07	15800000	=	15800000	=
	NDW06GW08	13500000	=	13100000	=
THALLIUM	NDW06GW07	63.5	U	63.5	U
	NDW06GW08	50.8	U	50.8	U
VANADIUM	NDW06GW07	11.2	U	11.2	U
	NDW06GW08	8.94	U	8.94	U
ZINC	NDW06GW07	10.2	U	10.2	U
	NDW06GW08	8.18	U	8.18	U
Volatile Organic Compounds (ug/L)					
1,1,1-TRICHLOROETHANE	NDW06GW07	0.5	U	-	
	NDW06GW08	0.5	U	-	
1,1,2,2-TETRACHLOROETHANE	NDW06GW07	0.5	U	-	
	NDW06GW08	0.5	U	-	
1,1,2-TRICHLORO-1,2,2-TRIFLUOROETHANE	NDW06GW07	0.5	U	-	
	NDW06GW08	0.5	U	-	
1,1,2-TRICHLOROETHANE	NDW06GW07	0.5	U	-	
	NDW06GW08	0.5	U	-	
1,1-DICHLOROETHANE	NDW06GW07	0.5	U	-	
	NDW06GW08	0.5	U	-	
1,1-DICHLOROETHENE	NDW06GW07	0.5	U	-	
	NDW06GW08	0.5	U	-	
1,2,3-TRICHLOROBENZENE	NDW06GW07	0.5	U	-	
	NDW06GW08	0.5	U	-	
1,2,4-TRICHLOROBENZENE	NDW06GW07	0.5	U	-	
	NDW06GW08	0.5	U	-	
1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	NDW06GW07	0.5	U	-	
	NDW06GW08	0.5	U	-	

TABLE 4-1
Analytical Results From Background Groundwater Samples
SWMU 6, Naval Ammunition Support Detachment
SWMU 6 Former NASD, Vieques Island, Puerto Rico

Chemical	Station ID	Concentration			
		Total	Qualifer	Dissolved	Qualifer
1,2-DICHLOROETHANE	NDW06GW07	0.5	U	-	
	NDW06GW08	0.5	U	-	
1,2-DICHLOROPROPANE	NDW06GW07	0.5	U	-	
	NDW06GW08	0.5	U	-	
1,3-DICHLOROBENZENE	NDW06GW07	0.5	U	-	
	NDW06GW08	0.5	U	-	
1,4-DICHLOROBENZENE	NDW06GW07	0.5	U	-	
	NDW06GW08	0.5	U	-	
2-HEXANONE	NDW06GW07	5	U	-	
	NDW06GW08	5	U	-	
ACETONE	NDW06GW07	62.3	U	-	
	NDW06GW08	5	U	-	
BENZENE	NDW06GW07	0.5	U	-	
	NDW06GW08	0.5	U	-	
BROMOCHLOROMETHANE	NDW06GW07	0.5	U	-	
	NDW06GW08	0.5	U	-	
BROMODICHLOROMETHANE	NDW06GW07	0.5	U	-	
	NDW06GW08	0.5	U	-	
BROMOFORM	NDW06GW07	0.5	U	-	
	NDW06GW08	0.5	U	-	
BROMOMETHANE	NDW06GW07	0.5	U	-	
	NDW06GW08	0.5	U	-	
CARBON DISULFIDE	NDW06GW07	3.8	=	-	
	NDW06GW08	0.5	U	-	
CARBON TETRACHLORIDE	NDW06GW07	0.5	U	-	
	NDW06GW08	0.5	U	-	
CHLOROBENZENE	NDW06GW07	0.5	U	-	
	NDW06GW08	0.5	U	-	
CHLOROETHANE	NDW06GW07	0.5	U	-	
	NDW06GW08	0.5	U	-	
CHLOROFORM	NDW06GW07	0.5	U	-	
	NDW06GW08	0.5	U	-	
CHLOROMETHANE	NDW06GW07	0.5	U	-	
	NDW06GW08	0.5	U	-	
cis-1,2-DICHLOROETHYLENE	NDW06GW07	0.5	U	-	
	NDW06GW08	0.5	U	-	
cis-1,3-DICHLOROPROPENE	NDW06GW07	0.5	U	-	
	NDW06GW08	0.5	U	-	
CYCLOHEXANE	NDW06GW07	0.5	U	-	
	NDW06GW08	0.5	U	-	
DIBROMOCHLOROMETHANE	NDW06GW07	0.5	U	-	
	NDW06GW08	0.5	U	-	
DICHLORODIFLUOROMETHANE	NDW06GW07	0.5	U	-	
	NDW06GW08	0.5	U	-	
ETHYLBENZENE	NDW06GW07	0.5	U	-	
	NDW06GW08	0.5	U	-	
METHYL ACETATE	NDW06GW07	2	U	-	
	NDW06GW08	2	U	-	
METHYL ETHYL KETONE (2-BUTANONE)	NDW06GW07	5	U	-	
	NDW06GW08	5	U	-	
METHYL ISOBUTYL KETONE (4-METHYL-2-PENTANONE)	NDW06GW07	5	U	-	
	NDW06GW08	5	U	-	
METHYLCYCLOHEXANE	NDW06GW07	0.5	U	-	
	NDW06GW08	0.5	U	-	
METHYLENE CHLORIDE	NDW06GW07	0.5	U	-	
	NDW06GW08	0.5	U	-	
STYRENE	NDW06GW07	0.5	U	-	
	NDW06GW08	0.5	U	-	
tert-BUTYL METHYL ETHER	NDW06GW07	0.5	U	-	
	NDW06GW08	0.5	U	-	
TETRACHLOROETHYLENE(PCE)	NDW06GW07	0.5	U	-	
	NDW06GW08	0.5	U	-	
TOLUENE	NDW06GW07	0.5	U	-	
	NDW06GW08	0.5	U	-	
trans-1,2-DICHLOROETHENE	NDW06GW07	0.5	U	-	
	NDW06GW08	0.5	U	-	

TABLE 4-1
Analytical Results From Background Groundwater Samples
SWMU 6, Naval Ammunition Support Detachment
SWMU 6 Former NASD, Vieques Island, Puerto Rico

Chemical	Station ID	Concentration			
		Total	Qualifer	Dissolved	Qualifer
trans-1,3-DICHLOROPROPENE	NDW06GW07	0.5	U	-	
	NDW06GW08	0.5	U	-	
TRICHLOROETHYLENE (TCE)	NDW06GW07	0.5	U	-	
	NDW06GW08	0.5	U	-	
TRICHLOROFLUOROMETHANE	NDW06GW07	0.5	U	-	
	NDW06GW08	0.5	U	-	
VINYL CHLORIDE	NDW06GW07	0.5	U	-	
	NDW06GW08	0.5	U	-	
XYLENES, TOTAL	NDW06GW07	2	U	-	
	NDW06GW08	2	U	-	
Semivolatile Organic Compounds (ug/L)					
1,2,4,5-TETRACHLOROBENZENE	NDW06GW07	5.1	U	-	
	NDW06GW08	5.1	U	-	
2,4,5-TRICHLOROPHENOL	NDW06GW07	20.4	U	-	
	NDW06GW08	20.4	U	-	
2,4,6-TRICHLOROPHENOL	NDW06GW07	5.1	U	-	
	NDW06GW08	5.1	U	-	
2,4-DICHLOROPHENOL	NDW06GW07	5.1	U	-	
	NDW06GW08	5.1	U	-	
2,4-DIMETHYLPHENOL	NDW06GW07	5.1	U	-	
	NDW06GW08	5.1	U	-	
2,4-DINITROPHENOL	NDW06GW07	20.4	U	-	
	NDW06GW08	20.4	U	-	
2,4-DINITROTOLUENE	NDW06GW07	5.1	U	-	
	NDW06GW08	5.1	U	-	
2,6-DINITROTOLUENE	NDW06GW07	5.1	U	-	
	NDW06GW08	5.1	U	-	
2-CHLORONAPHTHALENE	NDW06GW07	5.1	U	-	
	NDW06GW08	5.1	U	-	
2-CHLOROPHENOL	NDW06GW07	5.1	U	-	
	NDW06GW08	5.1	U	-	
2-METHYLNAPHTHALENE	NDW06GW07	5.1	U	-	
	NDW06GW08	5.1	U	-	
2-METHYLPHENOL (o-CRESOL)	NDW06GW07	5.1	U	-	
	NDW06GW08	5.1	U	-	
2-NITROANILINE	NDW06GW07	20.4	U	-	
	NDW06GW08	20.4	U	-	
2-NITROPHENOL	NDW06GW07	5.1	U	-	
	NDW06GW08	5.1	U	-	
3,3'-DICHLOROBENZIDINE	NDW06GW07	5.1	U	-	
	NDW06GW08	5.1	U	-	
3-NITROANILINE	NDW06GW07	20.4	U	-	
	NDW06GW08	20.4	U	-	
4,6-DINITRO-2-METHYLPHENOL	NDW06GW07	20.4	U	-	
	NDW06GW08	20.4	U	-	
4-BROMOPHENYL PHENYL ETHER	NDW06GW07	5.1	U	-	
	NDW06GW08	5.1	U	-	
4-CHLORO-3-METHYLPHENOL	NDW06GW07	5.1	U	-	
	NDW06GW08	5.1	U	-	
4-CHLOROANILINE	NDW06GW07	5.1	U	-	
	NDW06GW08	5.1	U	-	
4-CHLOROPHENYL PHENYL ETHER	NDW06GW07	5.1	U	-	
	NDW06GW08	5.1	U	-	
4-METHYLPHENOL (p-CRESOL)	NDW06GW07	5.1	U	-	
	NDW06GW08	5.1	U	-	
4-NITROANILINE	NDW06GW07	20.4	U	-	
	NDW06GW08	20.4	U	-	
4-NITROPHENOL	NDW06GW07	20.4	U	-	
	NDW06GW08	20.4	U	-	
ACENAPHTHENE	NDW06GW07	5.1	U	-	
	NDW06GW08	5.1	U	-	
ACENAPHTHYLENE	NDW06GW07	5.1	U	-	
	NDW06GW08	5.1	U	-	
ACETOPHENONE	NDW06GW07	5.1	U	-	
	NDW06GW08	5.1	U	-	
ANTHRACENE	NDW06GW07	5.1	U	-	

TABLE 4-1
Analytical Results From Background Groundwater Samples
SWMU 6, Naval Ammunition Support Detachment
SWMU 6 Former NASD, Vieques Island, Puerto Rico

Chemical	Station ID	Concentration			
		Total	Qualifer	Dissolved	Qualifer
	NDW06GW08	5.1	U	-	
ATRAZINE	NDW06GW07	5.1	U	-	
	NDW06GW08	5.1	U	-	
Benzaldehyde	NDW06GW07	5.1	U	-	
	NDW06GW08	5.1	U	-	
BENZO(a)ANTHRACENE	NDW06GW07	5.1	U	-	
	NDW06GW08	5.1	U	-	
BENZO(a)PYRENE	NDW06GW07	5.1	U	-	
	NDW06GW08	5.1	U	-	
BENZO(b)FLUORANTHENE	NDW06GW07	5.1	U	-	
	NDW06GW08	5.1	U	-	
BENZO(g,h,i)PERYLENE	NDW06GW07	5.1	U	-	
	NDW06GW08	5.1	U	-	
BENZO(k)FLUORANTHENE	NDW06GW07	5.1	U	-	
	NDW06GW08	5.1	U	-	
BENZYL BUTYL PHTHALATE	NDW06GW07	5.1	U	-	
	NDW06GW08	5.1	U	-	
BIPHENYL (DIPHENYL)	NDW06GW07	5.1	U	-	
	NDW06GW08	5.1	U	-	
bis(2-CHLOROETHOXY) METHANE	NDW06GW07	5.1	U	-	
	NDW06GW08	5.1	U	-	
bis(2-CHLOROETHYL) ETHER (2-CHLOROETHYL ETHER)	NDW06GW07	5.1	U	-	
	NDW06GW08	5.1	U	-	
bis(2-CHLOROISOPROPYL) ETHER	NDW06GW07	5.1	U	-	
	NDW06GW08	5.1	U	-	
bis(2-ETHYLHEXYL) PHTHALATE	NDW06GW07	10.2	U	-	
	NDW06GW08	10.2	U	-	
CARBAZOLE	NDW06GW07	10.2	U	-	
	NDW06GW08	10.2	U	-	
CHRYSENE	NDW06GW07	5.1	U	-	
	NDW06GW08	5.1	U	-	
DI-n-BUTYL PHTHALATE	NDW06GW07	5.1	U	-	
	NDW06GW08	5.1	U	-	
DI-n-OCTYLPHTHALATE	NDW06GW07	5.1	U	-	
	NDW06GW08	8.1	J	-	
DIBENZ(a,h)ANTHRACENE	NDW06GW07	5.1	U	-	
	NDW06GW08	5.1	U	-	
DIBENZOFURAN	NDW06GW07	5.1	U	-	
	NDW06GW08	5.1	U	-	
DIETHYL PHTHALATE	NDW06GW07	5.1	U	-	
	NDW06GW08	5.1	U	-	
DIMETHYL PHTHALATE	NDW06GW07	5.1	U	-	
	NDW06GW08	5.1	U	-	
FLUORANTHENE	NDW06GW07	5.1	U	-	
	NDW06GW08	5.1	U	-	
FLUORENE	NDW06GW07	5.1	U	-	
	NDW06GW08	5.1	U	-	
HEXACHLOROBENZENE	NDW06GW07	5.1	U	-	
	NDW06GW08	5.1	U	-	
HEXACHLOROBUTADIENE	NDW06GW07	5.1	U	-	
	NDW06GW08	5.1	U	-	
HEXACHLOROCYCLOPENTADIENE	NDW06GW07	5.1	U	-	
	NDW06GW08	5.1	U	-	
HEXACHLOROETHANE	NDW06GW07	5.1	U	-	
	NDW06GW08	5.1	U	-	
INDENO(1,2,3-c,d)PYRENE	NDW06GW07	5.1	U	-	
	NDW06GW08	5.1	U	-	
ISOPHORONE	NDW06GW07	5.1	U	-	
	NDW06GW08	5.1	U	-	
N-NITROSODI-n-PROPYLAMINE	NDW06GW07	5.1	U	-	
	NDW06GW08	5.1	U	-	
N-NITROSODIPHENYLAMINE	NDW06GW07	5.1	U	-	
	NDW06GW08	5.1	U	-	
NAPHTHALENE	NDW06GW07	5.1	U	-	
	NDW06GW08	5.1	U	-	
NITROBENZENE	NDW06GW07	5.1	U	-	

TABLE 4-1
Analytical Results From Background Groundwater Samples
SWMU 6, Naval Ammunition Support Detachment
SWMU 6 Former NASD, Vieques Island, Puerto Rico

Chemical	Station ID	Concentration Total	Qualifer	Dissolved	Qualifer
	NDW06GW08	5.1	U	-	
PENTACHLOROPHENOL	NDW06GW07	20.4	U	-	
	NDW06GW08	20.4	U	-	
PHENANTHRENE	NDW06GW07	5.1	U	-	
	NDW06GW08	5.1	U	-	
PHENOL	NDW06GW07	5.1	U	-	
	NDW06GW08	5.1	U	-	
PYRENE	NDW06GW07	5.1	U	-	
	NDW06GW08	5.1	U	-	
Explosives (ug/L)					
1,3,5-TRINITROBENZENE	NDW06GW07	2.5	UJ	-	
	NDW06GW08	2.5	UJ	-	
1,3-DINITROBENZENE	NDW06GW07	2.5	UJ	-	
	NDW06GW08	2.5	UJ	-	
2,4,6-TRINITROTOLUENE	NDW06GW07	2.5	UJ	-	
	NDW06GW08	2.5	UJ	-	
2,4-DINITROTOLUENE	NDW06GW07	2.5	UJ	-	
	NDW06GW08	2.5	UJ	-	
2,6-DINITROTOLUENE	NDW06GW07	2.5	UJ	-	
	NDW06GW08	2.5	UJ	-	
2-NITROTOLUENE	NDW06GW07	2.5	UJ	-	
	NDW06GW08	2.5	UJ	-	
3-NITROTOLUENE	NDW06GW07	2.5	UJ	-	
	NDW06GW08	2.5	UJ	-	
4-NITROTOLUENE	NDW06GW07	2.5	UJ	-	
	NDW06GW08	2.5	UJ	-	
HEXAHYDRO-1,3,5-TRINITRO-1,3,5,7-TETRAZOCINE	NDW06GW07	2.5	UJ	-	
	NDW06GW08	2.5	UJ	-	
NITROBENZENE	NDW06GW07	2.5	UJ	-	
	NDW06GW08	2.5	UJ	-	
OCTAHYDRO-1,3,5,7-TETRANITRO-1,3,5,7-TETRAZOCINE	NDW06GW07	2.5	UJ	-	
	NDW06GW08	2.5	UJ	-	
TETRYL	NDW06GW07	2.5	UJ	-	
	NDW06GW08	2.5	UJ	-	
Perchlorate (ug/L)					
Perchlorate	NDW06GW07	20	U	-	
	NDW06GW08	20	U	-	
Pesticides (ug/L)					
ALDRIN	NDW06GW07	0.01	U	-	
	NDW06GW08	0.029	U	-	
ALPHA BHC (ALPHA HEXACHLOROCYCLOHEXANE)	NDW06GW07	0.01	U	-	
	NDW06GW08	0.029	U	-	
ALPHA ENDOSULFAN	NDW06GW07	0.01	U	-	
	NDW06GW08	0.029	U	-	
ALPHA-CHLORDANE	NDW06GW07	0.01	U	-	
	NDW06GW08	0.029	U	-	
BETA BHC (BETA HEXACHLOROCYCLOHEXANE)	NDW06GW07	0.01	U	-	
	NDW06GW08	0.029	U	-	
BETA ENDOSULFAN	NDW06GW07	0.02	U	-	
	NDW06GW08	0.059	U	-	
DELTA BHC (DELTA HEXACHLOROCYCLOHEXANE)	NDW06GW07	0.01	U	-	
	NDW06GW08	0.029	U	-	
DIELDRIN	NDW06GW07	0.02	U	-	
	NDW06GW08	0.059	U	-	
ENDOSULFAN SULFATE	NDW06GW07	0.02	U	-	
	NDW06GW08	0.059	U	-	
ENDRIN	NDW06GW07	0.02	U	-	
	NDW06GW08	0.059	U	-	
ENDRIN ALDEHYDE	NDW06GW07	0.02	U	-	
	NDW06GW08	0.059	U	-	
ENDRIN KETONE	NDW06GW07	0.02	U	-	
	NDW06GW08	0.059	U	-	
GAMMA BHC (LINDANE)	NDW06GW07	0.01	U	-	
	NDW06GW08	0.029	U	-	
GAMMA-CHLORDANE	NDW06GW07	0.01	U	-	
	NDW06GW08	0.029	U	-	

TABLE 4-1
Analytical Results From Background Groundwater Samples
SWMU 6, Naval Ammunition Support Detachment
SWMU 6 Former NASD, Vieques Island, Puerto Rico

Chemical	Station ID	Concentration Total	Qualifer	Dissolved	Qualifer
HEPTACHLOR	NDW06GW07	0.01	U	-	
	NDW06GW08	0.029	U	-	
HEPTACHLOR EPOXIDE	NDW06GW07	0.01	U	-	
	NDW06GW08	0.029	U	-	
METHOXYCHLOR	NDW06GW07	0.1	U	-	
	NDW06GW08	0.29	U	-	
p,p'-DDD	NDW06GW07	0.02	U	-	
	NDW06GW08	0.059	U	-	
p,p'-DDE	NDW06GW07	0.02	U	-	
	NDW06GW08	0.059	U	-	
p,p'-DDT	NDW06GW07	0.02	U	-	
	NDW06GW08	0.059	U	-	
TOXAPHENE	NDW06GW07	0.05	U	-	
	NDW06GW08	0.15	U	-	
Polychlorinated Biphenyls (ug/L)					
PCB-1016 (AROCLOR 1016)	NDW06GW07	1	U	-	
	NDW06GW08	2.9	U	-	
PCB-1221 (AROCLOR 1221)	NDW06GW07	0.2	U	-	
	NDW06GW08	0.59	U	-	
PCB-1232 (AROCLOR 1232)	NDW06GW07	0.4	U	-	
	NDW06GW08	1.2	U	-	
PCB-1242 (AROCLOR 1242)	NDW06GW07	0.2	U	-	
	NDW06GW08	0.59	U	-	
PCB-1248 (AROCLOR 1248)	NDW06GW07	0.2	U	-	
	NDW06GW08	0.59	U	-	
PCB-1254 (AROCLOR 1254)	NDW06GW07	0.2	U	-	
	NDW06GW08	0.59	U	-	
PCB-1260 (AROCLOR 1260)	NDW06GW07	0.2	U	-	
	NDW06GW08	0.59	U	-	

U indicates that the chemical was not detected. The reported value is the minimum detection limit (MDL, inorganics) or the reporting limit (RL, organics).
UJ indicates that the chemical was not detected and the quantitation limit may be inaccurate or imprecise.
J indicates that the chemical was detected. The reported value is estimated.
= indicates that the chemical was detected. The reported value is the measured concentration.
- indicates that the chemical was not sampled or analyzed for in the dissolved sample.

TABLE 4-2
Analytical Results From Background Surface Water Samples
SWMU 6, Naval Ammunition Support Detachment
SWMU 6 Former NASD, Vieques Island, Puerto Rico

Chemical	Station ID	Concentration			
		Total	Qualifer	Dissolved	Qualifer
Metals (ug/L)					
ALUMINUM	NDW06SW10	700	U	700	U
	NDW06SW11	700	U	700	U
ANTIMONY	NDW06SW10	50	U	50	U
	NDW06SW11	50	U	50	U
ARSENIC	NDW06SW10	40.8	UJ	40.8	U
	NDW06SW11	40.8	UJ	40.8	U
BARIUM	NDW06SW10	14.9	J	13.6	J
	NDW06SW11	11.9	J	11	J
BERYLLIUM	NDW06SW10	1.89	U	1.89	U
	NDW06SW11	1.89	U	1.89	U
CADMIUM	NDW06SW10	7.12	U	7.12	U
	NDW06SW11	7.12	U	7.12	U
CALCIUM	NDW06SW10	507000	J	482000	J
	NDW06SW11	502000	J	459000	J
CHROMIUM, TOTAL	NDW06SW10	11.4	U	11.4	U
	NDW06SW11	11.4	U	11.4	U
COBALT	NDW06SW10	11.4	U	11.4	U
	NDW06SW11	11.4	U	11.4	U
COPPER	NDW06SW10	23.4	U	23.4	U
	NDW06SW11	23.4	U	23.4	U
IRON	NDW06SW10	334	U	334	UJ
	NDW06SW11	334	U	334	UJ
LEAD	NDW06SW10	35.2	UJ	35.2	U
	NDW06SW11	35.2	UJ	35.2	U
MAGNESIUM	NDW06SW10	1520000	J	1460000	J
	NDW06SW11	1490000	J	1390000	J
MANGANESE	NDW06SW10	13.1	J	7	J
	NDW06SW11	8.55	J	3.84	J
MERCURY	NDW06SW10	0.0234	J	0.0561	J
	NDW06SW11	0.04	J	0.056	J
NICKEL	NDW06SW10	19.9	U	19.9	U
	NDW06SW11	19.9	U	19.9	U
POTASSIUM	NDW06SW10	817000	J	782000	J
	NDW06SW11	803000	J	750000	J
SELENIUM	NDW06SW10	42	U	42	U
	NDW06SW11	42	U	42	U
SILVER	NDW06SW10	9.44	U	9.44	U
	NDW06SW11	9.44	U	9.44	U
SODIUM	NDW06SW10	12200000	J	12100000	J
	NDW06SW11	12000000	J	11700000	J
THALLIUM	NDW06SW10	50.8	UJ	50.8	U
	NDW06SW11	50.8	UJ	50.8	U
VANADIUM	NDW06SW10	8.94	U	8.94	U
	NDW06SW11	8.94	U	8.94	U
ZINC	NDW06SW10	8.18	U	8.18	U
	NDW06SW11	8.18	U	8.18	U
Volatile Organic Compounds (ug/L)					
1,1,1-TRICHLOROETHANE	NDW06SW10	0.5	U	-	
	NDW06SW11	0.5	U	-	
1,1,2,2-TETRACHLOROETHANE	NDW06SW10	0.5	U	-	
	NDW06SW11	0.5	U	-	
1,1,2-TRICHLORO-1,2,2-TRIFLUOROETHANE	NDW06SW10	0.5	U	-	
	NDW06SW11	0.5	U	-	
1,1,2-TRICHLOROETHANE	NDW06SW10	0.5	U	-	
	NDW06SW11	0.5	U	-	
1,1-DICHLOROETHANE	NDW06SW10	0.5	U	-	
	NDW06SW11	0.5	U	-	
1,1-DICHLOROETHENE	NDW06SW10	0.5	U	-	
	NDW06SW11	0.5	U	-	
1,2,4-TRICHLOROBENZENE	NDW06SW10	0.5	U	-	
	NDW06SW11	0.5	U	-	
1,2-DIBROMO-3-CHLOROPROPANE	NDW06SW10	2	U	-	
	NDW06SW11	2	U	-	

TABLE 4-2
Analytical Results From Background Surface Water Samples
SWMU 6, Naval Ammunition Support Detachment
SWMU 6 Former NASD, Vieques Island, Puerto Rico

Chemical	Station ID	Concentration			
		Total	Qualifer	Dissolved	Qualifer
1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	NDW06SW10	0.5	U	-	
	NDW06SW11	0.5	U	-	
1,2-DICHLOROBENZENE	NDW06SW10	0.5	U	-	
	NDW06SW11	0.5	U	-	
1,2-DICHLOROETHANE	NDW06SW10	0.5	U	-	
	NDW06SW11	0.5	U	-	
1,2-DICHLOROPROPANE	NDW06SW10	0.5	U	-	
	NDW06SW11	0.5	U	-	
1,3-DICHLOROBENZENE	NDW06SW10	0.5	U	-	
	NDW06SW11	0.5	U	-	
1,4-DICHLOROBENZENE	NDW06SW10	0.5	U	-	
	NDW06SW11	0.5	U	-	
2-HEXANONE	NDW06SW10	5	U	-	
	NDW06SW11	5	U	-	
ACETONE	NDW06SW10	5.7	U	-	
	NDW06SW11	6.2	U	-	
BENZENE	NDW06SW10	0.5	U	-	
	NDW06SW11	0.5	U	-	
BROMOCHLOROMETHANE	NDW06SW10	0.5	U	-	
	NDW06SW11	0.5	U	-	
BROMODICHLOROMETHANE	NDW06SW10	0.5	U	-	
	NDW06SW11	0.5	U	-	
BROMOFORM	NDW06SW10	0.5	U	-	
	NDW06SW11	0.5	U	-	
BROMOMETHANE	NDW06SW10	0.5	U	-	
	NDW06SW11	0.5	U	-	
CARBON DISULFIDE	NDW06SW10	0.5	U	-	
	NDW06SW11	0.5	U	-	
CARBON TETRACHLORIDE	NDW06SW10	0.5	U	-	
	NDW06SW11	0.5	U	-	
CHLOROBENZENE	NDW06SW10	0.5	U	-	
	NDW06SW11	0.5	U	-	
CHLOROETHANE	NDW06SW10	0.5	U	-	
	NDW06SW11	0.5	U	-	
CHLOROFORM	NDW06SW10	0.5	U	-	
	NDW06SW11	0.5	U	-	
CHLOROMETHANE	NDW06SW10	0.5	U	-	
	NDW06SW11	0.5	U	-	
cis-1,2-DICHLOROETHYLENE	NDW06SW10	0.5	U	-	
	NDW06SW11	0.5	U	-	
cis-1,3-DICHLOROPROPENE	NDW06SW10	0.5	U	-	
	NDW06SW11	0.5	U	-	
CYCLOHEXANE	NDW06SW10	0.5	U	-	
	NDW06SW11	0.5	U	-	
DIBROMOCHLOROMETHANE	NDW06SW10	0.5	U	-	
	NDW06SW11	0.5	U	-	
DICHLORODIFLUOROMETHANE	NDW06SW10	0.5	U	-	
	NDW06SW11	0.5	U	-	
ETHYLBENZENE	NDW06SW10	0.5	U	-	
	NDW06SW11	0.5	U	-	
METHYL ACETATE	NDW06SW10	2	U	-	
	NDW06SW11	2	U	-	
METHYL ETHYL KETONE (2-BUTANONE)	NDW06SW10	5	U	-	
	NDW06SW11	5	U	-	
METHYL ISOBUTYL KETONE (4-METHYL-2-PENTANONE)	NDW06SW10	5	U	-	
	NDW06SW11	5	U	-	
METHYLCYCLOHEXANE	NDW06SW10	0.5	U	-	
	NDW06SW11	0.5	U	-	
METHYLENE CHLORIDE	NDW06SW10	0.5	U	-	
	NDW06SW11	0.5	U	-	
STYRENE	NDW06SW10	0.5	U	-	
	NDW06SW11	0.5	U	-	
tert-BUTYL METHYL ETHER	NDW06SW10	0.5	U	-	
	NDW06SW11	0.5	U	-	

TABLE 4-2
Analytical Results From Background Surface Water Samples
SWMU 6, Naval Ammunition Support Detachment
SWMU 6 Former NASD, Vieques Island, Puerto Rico

Chemical	Station ID	Concentration			
		Total	Qualifer	Dissolved	Qualifer
TETRACHLOROETHYLENE(PCE)	NDW06SW10	0.5	U	-	
	NDW06SW11	0.5	U	-	
TOLUENE	NDW06SW10	0.5	U	-	
	NDW06SW11	0.5	U	-	
trans-1,2-DICHLOROETHENE	NDW06SW10	0.5	U	-	
	NDW06SW11	0.5	U	-	
trans-1,3-DICHLOROPROPENE	NDW06SW10	0.5	U	-	
	NDW06SW11	0.5	U	-	
TRICHLOROETHYLENE (TCE)	NDW06SW10	0.5	U	-	
	NDW06SW11	0.5	U	-	
TRICHLOROFLUOROMETHANE	NDW06SW10	0.5	U	-	
	NDW06SW11	0.5	U	-	
VINYL CHLORIDE	NDW06SW10	0.5	U	-	
	NDW06SW11	0.5	U	-	
XYLENES, TOTAL	NDW06SW10	2	U	-	
	NDW06SW11	2	U	-	
Semivolatile Organic Compounds (ug/L)					
1,2,4,5-TETRACHLOROBENZENE	NDW06SW10	5	U	-	
	NDW06SW11	5.2	U	-	
2,4,5-TRICHLOROPHENOL	NDW06SW10	20	U	-	
	NDW06SW11	20.6	U	-	
2,4,6-TRICHLOROPHENOL	NDW06SW10	5	U	-	
	NDW06SW11	5.2	U	-	
2,4-DICHLOROPHENOL	NDW06SW10	5	U	-	
	NDW06SW11	5.2	U	-	
2,4-DIMETHYLPHENOL	NDW06SW10	5	U	-	
	NDW06SW11	5.2	U	-	
2,4-DINITROPHENOL	NDW06SW10	20	U	-	
	NDW06SW11	20.6	U	-	
2,4-DINITROTOLUENE	NDW06SW10	5	U	-	
	NDW06SW11	5.2	U	-	
2,6-DINITROTOLUENE	NDW06SW10	5	U	-	
	NDW06SW11	5.2	U	-	
2-CHLORONAPHTHALENE	NDW06SW10	5	U	-	
	NDW06SW11	5.2	U	-	
2-CHLOROPHENOL	NDW06SW10	5	U	-	
	NDW06SW11	5.2	U	-	
2-METHYLNAPHTHALENE	NDW06SW10	5	U	-	
	NDW06SW11	5.2	U	-	
2-METHYLPHENOL (o-CRESOL)	NDW06SW10	5	U	-	
	NDW06SW11	5.2	U	-	
2-NITROANILINE	NDW06SW10	20	U	-	
	NDW06SW11	20.6	U	-	
2-NITROPHENOL	NDW06SW10	5	U	-	
	NDW06SW11	5.2	U	-	
3,3'-DICHLOROBENZIDINE	NDW06SW10	5	U	-	
	NDW06SW11	5.2	U	-	
3-NITROANILINE	NDW06SW10	20	U	-	
	NDW06SW11	20.6	U	-	
4,6-DINITRO-2-METHYLPHENOL	NDW06SW10	20	U	-	
	NDW06SW11	20.6	U	-	
4-BROMOPHENYL PHENYL ETHER	NDW06SW10	5	U	-	
	NDW06SW11	5.2	U	-	
4-CHLORO-3-METHYLPHENOL	NDW06SW10	5	U	-	
	NDW06SW11	5.2	U	-	
4-CHLOROANILINE	NDW06SW10	5	U	-	
	NDW06SW11	5.2	U	-	
4-CHLOROPHENYL PHENYL ETHER	NDW06SW10	5	U	-	
	NDW06SW11	5.2	U	-	
4-METHYLPHENOL (p-CRESOL)	NDW06SW10	5	U	-	
	NDW06SW11	5.2	U	-	
4-NITROANILINE	NDW06SW10	20	U	-	
	NDW06SW11	20.6	U	-	
4-NITROPHENOL	NDW06SW10	20	U	-	

TABLE 4-2
Analytical Results From Background Surface Water Samples
SWMU 6, Naval Ammunition Support Detachment
SWMU 6 Former NASD, Vieques Island, Puerto Rico

Chemical	Station ID	Concentration			
		Total	Qualifer	Dissolved	Qualifer
	NDW06SW11	20.6	U	-	
ACENAPHTHENE	NDW06SW10	5	U	-	
	NDW06SW11	5.2	U	-	
ACENAPHTHYLENE	NDW06SW10	5	U	-	
	NDW06SW11	5.2	U	-	
ACETOPHENONE	NDW06SW10	5	U	-	
	NDW06SW11	5.2	U	-	
ANTHRACENE	NDW06SW10	5	U	-	
	NDW06SW11	5.2	U	-	
ATRAZINE	NDW06SW10	5	U	-	
	NDW06SW11	5.2	U	-	
Benzaldehyde	NDW06SW10	5	U	-	
	NDW06SW11	5.2	U	-	
BENZO(a)ANTHRACENE	NDW06SW10	5	U	-	
	NDW06SW11	5.2	U	-	
BENZO(a)PYRENE	NDW06SW10	5	U	-	
	NDW06SW11	5.2	U	-	
BENZO(b)FLUORANTHENE	NDW06SW10	5	U	-	
	NDW06SW11	5.2	U	-	
BENZO(g,h,i)PERYLENE	NDW06SW10	5	U	-	
	NDW06SW11	5.2	U	-	
BENZO(k)FLUORANTHENE	NDW06SW10	5	U	-	
	NDW06SW11	5.2	U	-	
BENZYL BUTYL PHTHALATE	NDW06SW10	5	U	-	
	NDW06SW11	5.2	U	-	
BIPHENYL (DIPHENYL)	NDW06SW10	5	U	-	
	NDW06SW11	5.2	U	-	
bis(2-CHLOROETHOXY) METHANE	NDW06SW10	5	U	-	
	NDW06SW11	5.2	U	-	
bis(2-CHLOROETHYL) ETHER (2-CHLOROETHYL ETHER)	NDW06SW10	5	U	-	
	NDW06SW11	5.2	U	-	
bis(2-CHLOROISOPROPYL) ETHER	NDW06SW10	5	U	-	
	NDW06SW11	5.2	U	-	
bis(2-ETHYLHEXYL) PHTHALATE	NDW06SW10	10	U	-	
	NDW06SW11	10.3	U	-	
CARBAZOLE	NDW06SW10	10	U	-	
	NDW06SW11	10.3	U	-	
CHRYSENE	NDW06SW10	5	U	-	
	NDW06SW11	5.2	U	-	
DI-n-BUTYL PHTHALATE	NDW06SW10	5	U	-	
	NDW06SW11	5.2	U	-	
DI-n-OCTYLPHTHALATE	NDW06SW10	5	U	-	
	NDW06SW11	6.9	=	-	
DIBENZ(a,h)ANTHRACENE	NDW06SW10	5	U	-	
	NDW06SW11	5.2	U	-	
DIBENZOFURAN	NDW06SW10	5	U	-	
	NDW06SW11	5.2	U	-	
DIETHYL PHTHALATE	NDW06SW10	5	U	-	
	NDW06SW11	5.2	U	-	
DIMETHYL PHTHALATE	NDW06SW10	5	U	-	
	NDW06SW11	5.2	U	-	
FLUORANTHENE	NDW06SW10	5	U	-	
	NDW06SW11	5.2	U	-	
FLUORENE	NDW06SW10	5	U	-	
	NDW06SW11	5.2	U	-	
HEXACHLOROBENZENE	NDW06SW10	5	U	-	
	NDW06SW11	5.2	U	-	
HEXACHLOROBUTADIENE	NDW06SW10	5	U	-	
	NDW06SW11	5.2	U	-	
HEXACHLOROCYCLOPENTADIENE	NDW06SW10	5	U	-	
	NDW06SW11	5.2	U	-	
HEXACHLOROETHANE	NDW06SW10	5	U	-	
	NDW06SW11	5.2	U	-	
INDENO(1,2,3-c,d)PYRENE	NDW06SW10	5	U	-	

TABLE 4-2
Analytical Results From Background Surface Water Samples
SWMU 6, Naval Ammunition Support Detachment
SWMU 6 Former NASD, Vieques Island, Puerto Rico

Chemical	Station ID	Concentration			
		Total	Qualifer	Dissolved	Qualifer
	NDW06SW11	5.2	U	-	
ISOPHORONE	NDW06SW10	5	U	-	
	NDW06SW11	5.2	U	-	
N-NITROSODI-n-PROPYLAMINE	NDW06SW10	5	U	-	
	NDW06SW11	5.2	U	-	
N-NITROSODIPHENYLAMINE	NDW06SW10	5	U	-	
	NDW06SW11	5.2	U	-	
NAPHTHALENE	NDW06SW10	5	U	-	
	NDW06SW11	5.2	U	-	
NITROBENZENE	NDW06SW10	5	U	-	
	NDW06SW11	5.2	U	-	
PENTACHLOROPHENOL	NDW06SW10	20	U	-	
	NDW06SW11	20.6	U	-	
PHENANTHRENE	NDW06SW10	5	U	-	
	NDW06SW11	5.2	U	-	
PHENOL	NDW06SW10	5	U	-	
	NDW06SW11	5.2	U	-	
PYRENE	NDW06SW10	5	U	-	
	NDW06SW11	5.2	U	-	
Explosives (ug/L)					
1,3,5-TRINITROBENZENE	NDW06SW10	2.5	U	-	
	NDW06SW11	2.5	U	-	
1,3-DINITROBENZENE	NDW06SW10	2.5	U	-	
	NDW06SW11	2.5	U	-	
2,4,6-TRINITROTOLUENE	NDW06SW10	2.5	U	-	
	NDW06SW11	2.5	U	-	
2,4-DINITROTOLUENE	NDW06SW10	2.5	U	-	
	NDW06SW11	2.5	U	-	
2,6-DINITROTOLUENE	NDW06SW10	2.5	U	-	
	NDW06SW11	2.5	U	-	
2-NITROTOLUENE	NDW06SW10	2.5	U	-	
	NDW06SW11	2.5	U	-	
3-NITROTOLUENE	NDW06SW10	2.5	U	-	
	NDW06SW11	2.5	U	-	
4-NITROTOLUENE	NDW06SW10	2.5	U	-	
	NDW06SW11	2.5	U	-	
HEXAHYDRO-1,3,5-TRINITRO-1,3,5,7-TETRAZOCINE	NDW06SW10	2.5	U	-	
	NDW06SW11	2.5	U	-	
NITROBENZENE	NDW06SW10	2.5	U	-	
	NDW06SW11	2.5	U	-	
OCTAHYDRO-1,3,5,7-TETRANITRO-1,3,5,7-TETRAZOCINE	NDW06SW10	2.5	U	-	
	NDW06SW11	2.5	U	-	
TETRYL	NDW06SW10	2.5	U	-	
	NDW06SW11	2.5	U	-	
Perchlorate (ug/L)					
Perchlorate	NDW06SW10	20	U	-	
	NDW06SW11	20	U	-	
Pesticides (ug/L)					
ALDRIN	NDW06SW10	0.0099	U	-	
	NDW06SW11	0.01	U	-	
ALPHA BHC (ALPHA HEXACHLOROCYCLOHEXANE)	NDW06SW10	0.0099	UJ	-	
	NDW06SW11	0.01	UJ	-	
ALPHA ENDOSULFAN	NDW06SW10	0.0099	U	-	
	NDW06SW11	0.01	U	-	
ALPHA-CHLORDANE	NDW06SW10	0.0099	U	-	
	NDW06SW11	0.01	U	-	
BETA BHC (BETA HEXACHLOROCYCLOHEXANE)	NDW06SW10	0.0099	U	-	
	NDW06SW11	0.01	U	-	
BETA ENDOSULFAN	NDW06SW10	0.02	U	-	
	NDW06SW11	0.02	U	-	
DELTA BHC (DELTA HEXACHLOROCYCLOHEXANE)	NDW06SW10	0.0099	U	-	
	NDW06SW11	0.01	U	-	
DIELDRIN	NDW06SW10	0.02	U	-	
	NDW06SW11	0.02	U	-	

TABLE 4-2
Analytical Results From Background Surface Water Samples
SWMU 6, Naval Ammunition Support Detachment
SWMU 6 Former NASD, Vieques Island, Puerto Rico

Chemical	Station ID	Concentration Total	Qualifer	Dissolved	Qualifer
ENDOSULFAN SULFATE	NDW06SW10	0.02	U	-	
	NDW06SW11	0.02	U	-	
ENDRIN	NDW06SW10	0.02	U	-	
	NDW06SW11	0.02	U	-	
ENDRIN ALDEHYDE	NDW06SW10	0.02	U	-	
	NDW06SW11	0.02	U	-	
ENDRIN KETONE	NDW06SW10	0.02	U	-	
	NDW06SW11	0.02	U	-	
GAMMA BHC (LINDANE)	NDW06SW10	0.0099	UJ	-	
	NDW06SW11	0.01	UJ	-	
GAMMA-CHLORDANE	NDW06SW10	0.0099	U	-	
	NDW06SW11	0.01	U	-	
HEPTACHLOR	NDW06SW10	0.0099	U	-	
	NDW06SW11	0.01	U	-	
HEPTACHLOR EPOXIDE	NDW06SW10	0.0099	U	-	
	NDW06SW11	0.01	U	-	
METHOXYCHLOR	NDW06SW10	0.099	U	-	
	NDW06SW11	0.1	U	-	
p,p'-DDD	NDW06SW10	0.02	U	-	
	NDW06SW11	0.02	U	-	
p,p'-DDE	NDW06SW10	0.02	U	-	
	NDW06SW11	0.02	U	-	
p,p'-DDT	NDW06SW10	0.02	U	-	
	NDW06SW11	0.02	U	-	
TOXAPHENE	NDW06SW10	0.05	U	-	
	NDW06SW11	0.05	U	-	
Polychlorinated Biphenyls (ug/L)					
PCB-1016 (AROCLOR 1016)	NDW06SW10	0.99	U	-	
	NDW06SW11	1	U	-	
PCB-1221 (AROCLOR 1221)	NDW06SW10	0.2	U	-	
	NDW06SW11	0.2	U	-	
PCB-1232 (AROCLOR 1232)	NDW06SW10	0.4	U	-	
	NDW06SW11	0.4	U	-	
PCB-1242 (AROCLOR 1242)	NDW06SW10	0.2	U	-	
	NDW06SW11	0.2	U	-	
PCB-1248 (AROCLOR 1248)	NDW06SW10	0.2	U	-	
	NDW06SW11	0.2	U	-	
PCB-1254 (AROCLOR 1254)	NDW06SW10	0.2	U	-	
	NDW06SW11	0.2	U	-	
PCB-1260 (AROCLOR 1260)	NDW06SW10	0.2	U	-	
	NDW06SW11	0.2	U	-	

U indicates that the chemical was not detected. The reported value is the minimum detection limit (MDL, inorganics) or the reporting limit (RL, organics).
= indicates that the chemical was detected. The reported value is the measured concentration.
J indicates that the chemical was detected. The reported value is estimated.
= indicates that the chemical was detected. The reported value is the measured concentration.
- indicates that the chemical was not sampled or analyzed for in the dissolved sample.

TABLE 4-3
Analytical Results From Background Sediment Samples
SWMU 6, Naval Ammunition Support Detachment
SWMU 6 Former NASD, Vieques Island, Puerto Rico

Chemical	Station ID	Concentration	Qualifer
Metals (mg/Kg)			
ALUMINUM	NDW06SD15	4520	J
	NDW06SD16	1950	J
ANTIMONY	NDW06SD15	0.216	UJ
	NDW06SD16	0.951	J
ARSENIC	NDW06SD15	0.712	J
	NDW06SD16	1.49	J
BARIUM	NDW06SD15	4.24	J
	NDW06SD16	3.88	J
BERYLLIUM	NDW06SD15	0.124	J
	NDW06SD16	0.055	J
CADMIUM	NDW06SD15	0.128	J
	NDW06SD16	0.0818	J
CALCIUM	NDW06SD15	5540	J
	NDW06SD16	74900	J
CHROMIUM, TOTAL	NDW06SD15	5.24	J
	NDW06SD16	4.91	J
COBALT	NDW06SD15	2.35	J
	NDW06SD16	1.26	J
COPPER	NDW06SD15	10.6	J
	NDW06SD16	6.26	J
IRON	NDW06SD15	5620	J
	NDW06SD16	3640	J
LEAD	NDW06SD15	3.07	J
	NDW06SD16	0.51	J
MAGNESIUM	NDW06SD15	6050	J
	NDW06SD16	6980	J
MANGANESE	NDW06SD15	53.3	J
	NDW06SD16	67	J
MERCURY	NDW06SD15	0.0383	J
	NDW06SD16	0.0192	J
NICKEL	NDW06SD15	2.68	J
	NDW06SD16	1.97	J
POTASSIUM	NDW06SD15	2100	J
	NDW06SD16	2040	J
SELENIUM	NDW06SD15	0.452	UJ
	NDW06SD16	0.595	J
SILVER	NDW06SD15	0.0547	UJ
	NDW06SD16	0.054	UJ
SODIUM	NDW06SD15	23000	J
	NDW06SD16	31400	J
THALLIUM	NDW06SD15	0.284	J
	NDW06SD16	0.273	UJ
VANADIUM	NDW06SD15	20.1	J
	NDW06SD16	8.22	J
ZINC	NDW06SD15	18.6	J

TABLE 4-3
Analytical Results From Background Sediment Samples
SWMU 6, Naval Ammunition Support Detachment
SWMU 6 Former NASD, Vieques Island, Puerto Rico

Chemical	Station ID	Concentration	Qualifer
	NDW06SD16	7.99	J
Volatile Organic Compounds (mg/Kg)			
1,1,1-TRICHLOROETHANE	NDW06SD15	0.0376	U
	NDW06SD16	0.04	U
1,1,2,2-TETRACHLOROETHANE	NDW06SD15	0.0376	U
	NDW06SD16	0.04	U
1,1,2-TRICHLORO-1,2,2-TRIFLUOROETHANE	NDW06SD15	0.0376	U
	NDW06SD16	0.04	U
1,1,2-TRICHLOROETHANE	NDW06SD15	0.0376	U
	NDW06SD16	0.04	U
1,1-DICHLOROETHANE	NDW06SD15	0.0376	U
	NDW06SD16	0.04	U
1,1-DICHLOROETHENE	NDW06SD15	0.0376	U
	NDW06SD16	0.04	U
1,2,4-TRICHLOROBENZENE	NDW06SD15	0.0376	U
	NDW06SD16	0.04	U
1,2-DIBROMO-3-CHLOROPROPANE	NDW06SD15	0.0376	U
	NDW06SD16	0.04	U
1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	NDW06SD15	0.0376	U
	NDW06SD16	0.04	U
1,2-DICHLOROBENZENE	NDW06SD15	0.0376	U
	NDW06SD16	0.04	U
1,2-DICHLOROETHANE	NDW06SD15	0.0376	U
	NDW06SD16	0.04	U
1,2-DICHLOROPROPANE	NDW06SD15	0.0376	U
	NDW06SD16	0.04	U
1,3-DICHLOROBENZENE	NDW06SD15	0.0376	U
	NDW06SD16	0.04	U
1,4-DICHLOROBENZENE	NDW06SD15	0.0376	U
	NDW06SD16	0.04	U
2-HEXANONE	NDW06SD15	0.0376	U
	NDW06SD16	0.04	U
ACETONE	NDW06SD15	0.0376	UJ
	NDW06SD16	0.04	UJ
BENZENE	NDW06SD15	0.0376	U
	NDW06SD16	0.04	U
BROMODICHLOROMETHANE	NDW06SD15	0.0376	U
	NDW06SD16	0.04	U
BROMOFORM	NDW06SD15	0.0376	U
	NDW06SD16	0.04	U
BROMOMETHANE	NDW06SD15	0.0376	U
	NDW06SD16	0.04	U
CARBON DISULFIDE	NDW06SD15	0.0376	U
	NDW06SD16	0.04	U
CARBON TETRACHLORIDE	NDW06SD15	0.0376	U
	NDW06SD16	0.04	U

TABLE 4-3
Analytical Results From Background Sediment Samples
SWMU 6, Naval Ammunition Support Detachment
SWMU 6 Former NASD, Vieques Island, Puerto Rico

Chemical	Station ID	Concentration	Qualifer
CHLOROBENZENE	NDW06SD15	0.0376	U
	NDW06SD16	0.04	U
CHLOROETHANE	NDW06SD15	0.0376	U
	NDW06SD16	0.04	U
CHLOROFORM	NDW06SD15	0.0376	U
	NDW06SD16	0.04	U
CHLOROMETHANE	NDW06SD15	0.0376	U
	NDW06SD16	0.04	U
cis-1,2-DICHLOROETHYLENE	NDW06SD15	0.0376	U
	NDW06SD16	0.04	U
cis-1,3-DICHLOROPROPENE	NDW06SD15	0.0376	U
	NDW06SD16	0.04	U
CYCLOHEXANE	NDW06SD15	0.0376	UJ
	NDW06SD16	0.04	UJ
DIBROMOCHLOROMETHANE	NDW06SD15	0.0376	U
	NDW06SD16	0.04	U
DICHLORODIFLUOROMETHANE	NDW06SD15	0.0376	U
	NDW06SD16	0.04	U
ETHYLBENZENE	NDW06SD15	0.0376	U
	NDW06SD16	0.04	U
ISOPROPYLBENZENE (CUMENE)	NDW06SD15	0.0376	U
	NDW06SD16	0.04	U
METHYL ACETATE	NDW06SD15	0.0376	U
	NDW06SD16	0.04	U
METHYL ETHYL KETONE (2-BUTANONE)	NDW06SD15	0.0376	U
	NDW06SD16	0.04	U
METHYL ISOBUTYL KETONE (4-METHYL-2-PENTANONE)	NDW06SD15	0.0376	U
	NDW06SD16	0.04	U
METHYLCYCLOHEXANE	NDW06SD15	0.0376	U
	NDW06SD16	0.04	U
METHYLENE CHLORIDE	NDW06SD15	0.0376	U
	NDW06SD16	0.04	U
STYRENE	NDW06SD15	0.0376	U
	NDW06SD16	0.04	U
tert-BUTYL METHYL ETHER	NDW06SD15	0.0376	U
	NDW06SD16	0.04	U
TETRACHLOROETHYLENE(PCE)	NDW06SD15	0.0376	U
	NDW06SD16	0.04	U
TOLUENE	NDW06SD15	0.0376	U
	NDW06SD16	0.04	U
trans-1,2-DICHLOROETHENE	NDW06SD15	0.0376	U
	NDW06SD16	0.04	U
trans-1,3-DICHLOROPROPENE	NDW06SD15	0.0376	U
	NDW06SD16	0.04	U
TRICHLOROETHYLENE (TCE)	NDW06SD15	0.0376	U
	NDW06SD16	0.04	U

TABLE 4-3
Analytical Results From Background Sediment Samples
SWMU 6, Naval Ammunition Support Detachment
SWMU 6 Former NASD, Vieques Island, Puerto Rico

Chemical	Station ID	Concentration	Qualifer
TRICHLOROFLUOROMETHANE	NDW06SD15	0.0376	U
	NDW06SD16	0.04	U
VINYL CHLORIDE	NDW06SD15	0.0376	U
	NDW06SD16	0.04	U
XYLENES, TOTAL	NDW06SD15	0.0376	U
	NDW06SD16	0.04	U
Semivolatile Organic Compounds (mg/Kg)			
2,4,5-TRICHLOROPHENOL	NDW06SD15	2.4	UJ
	NDW06SD16	2.45	UJ
2,4-DICHLOROPHENOL	NDW06SD15	0.8	U
	NDW06SD16	0.816	U
2,4-DIMETHYLPHENOL	NDW06SD15	0.8	U
	NDW06SD16	0.816	U
2,4-DINITROPHENOL	NDW06SD15	2.4	UJ
	NDW06SD16	2.45	UJ
2,4-DINITROTOLUENE	NDW06SD15	0.8	U
	NDW06SD16	0.816	U
2,6-DINITROTOLUENE	NDW06SD15	0.8	U
	NDW06SD16	0.816	U
2-CHLORONAPHTHALENE	NDW06SD15	0.8	U
	NDW06SD16	0.816	U
2-CHLOROPHENOL	NDW06SD15	0.8	U
	NDW06SD16	0.816	U
2-METHYLNAPHTHALENE	NDW06SD15	0.8	U
	NDW06SD16	0.816	U
2-METHYLPHENOL (o-CRESOL)	NDW06SD15	0.8	U
	NDW06SD16	0.816	U
2-NITROANILINE	NDW06SD15	2.4	U
	NDW06SD16	2.45	U
2-NITROPHENOL	NDW06SD15	0.8	U
	NDW06SD16	0.816	U
3,3'-DICHLOROBENZIDINE	NDW06SD15	1.62	U
	NDW06SD16	1.66	U
3-NITROANILINE	NDW06SD15	2.4	U
	NDW06SD16	2.45	U
4,6-DINITRO-2-METHYLPHENOL	NDW06SD15	2.4	UJ
	NDW06SD16	2.45	UJ
4-BROMOPHENYL PHENYL ETHER	NDW06SD15	0.8	U
	NDW06SD16	0.816	U
4-CHLORO-3-METHYLPHENOL	NDW06SD15	0.8	U
	NDW06SD16	0.816	U
4-CHLOROANILINE	NDW06SD15	0.8	U
	NDW06SD16	0.816	U
4-CHLOROPHENYL PHENYL ETHER	NDW06SD15	0.8	U
	NDW06SD16	0.816	U
4-METHYLPHENOL (p-CRESOL)	NDW06SD15	0.8	U

TABLE 4-3
Analytical Results From Background Sediment Samples
SWMU 6, Naval Ammunition Support Detachment
SWMU 6 Former NASD, Vieques Island, Puerto Rico

Chemical	Station ID	Concentration	Qualifer
	NDW06SD16	0.816	U
4-NITROANILINE	NDW06SD15	2.4	U
	NDW06SD16	2.45	U
4-NITROPHENOL	NDW06SD15	2.4	U
	NDW06SD16	2.45	U
ACENAPHTHENE	NDW06SD15	0.8	U
	NDW06SD16	0.816	U
ACENAPHTHYLENE	NDW06SD15	0.8	U
	NDW06SD16	0.816	U
ANTHRACENE	NDW06SD15	0.8	U
	NDW06SD16	0.816	U
ATRAZINE	NDW06SD15	0.8	U
	NDW06SD16	0.816	U
BENZO(a)ANTHRACENE	NDW06SD15	0.8	U
	NDW06SD16	0.816	U
BENZO(a)PYRENE	NDW06SD15	0.8	U
	NDW06SD16	0.816	U
BENZO(b)FLUORANTHENE	NDW06SD15	0.8	U
	NDW06SD16	0.816	U
BENZO(g,h,i)PERYLENE	NDW06SD15	0.8	U
	NDW06SD16	0.816	U
BENZO(k)FLUORANTHENE	NDW06SD15	0.8	U
	NDW06SD16	0.816	U
BENZYL BUTYL PHTHALATE	NDW06SD15	0.8	U
	NDW06SD16	0.816	U
BIPHENYL (DIPHENYL)	NDW06SD15	0.8	U
	NDW06SD16	0.816	U
bis(2-CHLOROETHYL) ETHER (2-CHLOROETHYL ETHER)	NDW06SD15	0.8	U
	NDW06SD16	0.816	U
bis(2-CHLOROISOPROPYL) ETHER	NDW06SD15	0.8	U
	NDW06SD16	0.816	U
bis(2-ETHYLHEXYL) PHTHALATE	NDW06SD15	0.8	U
	NDW06SD16	0.816	U
CAPROLACTAM	NDW06SD15	0.8	U
	NDW06SD16	0.816	U
CARBAZOLE	NDW06SD15	0.8	U
	NDW06SD16	0.816	U
CHRYSENE	NDW06SD15	0.8	U
	NDW06SD16	0.816	U
DI-n-BUTYL PHTHALATE	NDW06SD15	0.8	U
	NDW06SD16	0.816	U
DI-n-OCTYLPHTHALATE	NDW06SD15	0.8	U
	NDW06SD16	0.816	U
DIBENZ(a,h)ANTHRACENE	NDW06SD15	0.8	U
	NDW06SD16	0.816	U
DIBENZOFURAN	NDW06SD15	0.8	U

TABLE 4-3
Analytical Results From Background Sediment Samples
SWMU 6, Naval Ammunition Support Detachment
SWMU 6 Former NASD, Vieques Island, Puerto Rico

Chemical	Station ID	Concentration	Qualifer
	NDW06SD16	0.816	U
DIETHYL PHTHALATE	NDW06SD15	0.8	U
	NDW06SD16	0.816	U
DIMETHYL PHTHALATE	NDW06SD15	0.8	U
	NDW06SD16	0.816	U
FLUORANTHENE	NDW06SD15	0.8	U
	NDW06SD16	0.816	U
FLUORENE	NDW06SD15	0.8	U
	NDW06SD16	0.816	U
HEXACHLOROBENZENE	NDW06SD15	0.8	U
	NDW06SD16	0.816	U
HEXACHLOROBUTADIENE	NDW06SD15	0.8	U
	NDW06SD16	0.816	U
HEXACHLOROCYCLOPENTADIENE	NDW06SD15	0.8	U
	NDW06SD16	0.816	U
INDENO(1,2,3-c,d)PYRENE	NDW06SD15	0.8	UJ
	NDW06SD16	0.816	UJ
ISOPHORONE	NDW06SD15	0.8	U
	NDW06SD16	0.816	U
N-NITROSODI-n-PROPYLAMINE	NDW06SD15	0.8	U
	NDW06SD16	0.816	U
N-NITROSODIPHENYLAMINE	NDW06SD15	0.8	U
	NDW06SD16	0.816	U
NITROBENZENE	NDW06SD15	0.8	U
	NDW06SD16	0.816	U
PHENANTHRENE	NDW06SD15	0.8	U
	NDW06SD16	0.816	U
PHENOL	NDW06SD15	0.8	U
	NDW06SD16	0.816	U
PYRENE	NDW06SD15	0.8	U
	NDW06SD16	0.816	U
Explosives (mg/Kg)			
1,3,5-TRINITROBENZENE	NDW06SD15	0.304	U
	NDW06SD16	0.311	U
1,3-DINITROBENZENE	NDW06SD15	0.304	U
	NDW06SD16	0.311	U
2,4,6-TRINITROTOLUENE	NDW06SD15	0.304	U
	NDW06SD16	0.311	U
2,4-DINITROTOLUENE	NDW06SD15	0.304	U
	NDW06SD16	0.311	U
2,6-DINITROTOLUENE	NDW06SD15	0.304	U
	NDW06SD16	0.311	U
2-NITROTOLUENE	NDW06SD15	0.304	U
	NDW06SD16	0.311	U
3-NITROTOLUENE	NDW06SD15	0.304	U
	NDW06SD16	0.311	U

TABLE 4-3
Analytical Results From Background Sediment Samples
SWMU 6, Naval Ammunition Support Detachment
SWMU 6 Former NASD, Vieques Island, Puerto Rico

Chemical	Station ID	Concentration	Qualifer
4-NITROTOLUENE	NDW06SD15	0.304	U
	NDW06SD16	0.311	U
HEXAHYDRO-1,3,5-TRINITRO-1,3,5,7-TETRAZOCINE	NDW06SD15	0.304	U
	NDW06SD16	0.311	U
NITROBENZENE	NDW06SD15	0.304	U
	NDW06SD16	0.311	U
OCTAHYDRO-1,3,5,7-TETRANITRO-1,3,5,7-TETRAZOCINE	NDW06SD15	0.304	U
	NDW06SD16	0.311	U
TETRYL	NDW06SD15	0.304	UJ
	NDW06SD16	0.311	UJ
Perchlorate (mg/Kg)			
Perchlorate	NDW06SD15	0.241	U
	NDW06SD16	0.396	U
Pesticides (mg/Kg)			
ALDRIN	NDW06SD15	0.0041	UJ
	NDW06SD16	0.0042	UJ
ALPHA BHC (ALPHA HEXACHLOROCYCLOHEXANE)	NDW06SD15	0.0041	U
	NDW06SD16	0.0042	UJ
ALPHA ENDOSULFAN	NDW06SD15	0.0041	U
	NDW06SD16	0.0042	UJ
ALPHA-CHLORDANE	NDW06SD15	0.0041	U
	NDW06SD16	0.0042	UJ
BETA BHC (BETA HEXACHLOROCYCLOHEXANE)	NDW06SD15	0.0041	U
	NDW06SD16	0.0042	UJ
BETA ENDOSULFAN	NDW06SD15	0.008	U
	NDW06SD16	0.0082	UJ
DELTA BHC (DELTA HEXACHLOROCYCLOHEXANE)	NDW06SD15	0.0041	U
	NDW06SD16	0.0042	UJ
DIELDRIN	NDW06SD15	0.008	U
	NDW06SD16	0.0082	UJ
ENDOSULFAN SULFATE	NDW06SD15	0.008	U
	NDW06SD16	0.0082	UJ
ENDRIN	NDW06SD15	0.008	U
	NDW06SD16	0.0082	UJ
ENDRIN ALDEHYDE	NDW06SD15	0.008	U
	NDW06SD16	0.0082	UJ
ENDRIN KETONE	NDW06SD15	0.008	UJ
	NDW06SD16	0.0082	UJ
GAMMA BHC (LINDANE)	NDW06SD15	0.0041	U
	NDW06SD16	0.0042	UJ
GAMMA-CHLORDANE	NDW06SD15	0.0041	U
	NDW06SD16	0.0042	UJ
HEPTACHLOR	NDW06SD15	0.0041	U
	NDW06SD16	0.0042	UJ
HEPTACHLOR EPOXIDE	NDW06SD15	0.0041	U
	NDW06SD16	0.0042	UJ

TABLE 4-3
Analytical Results From Background Sediment Samples
SWMU 6, Naval Ammunition Support Detachment
SWMU 6 Former NASD, Vieques Island, Puerto Rico

Chemical	Station ID	Concentration	Qualifer
METHOXYCHLOR	NDW06SD15	0.041	U
	NDW06SD16	0.042	UJ
p,p'-DDD	NDW06SD15	0.0011	J
	NDW06SD16	0.0082	UJ
p,p'-DDE	NDW06SD15	0.0028	J
	NDW06SD16	0.0082	UJ
p,p'-DDT	NDW06SD15	0.008	UJ
	NDW06SD16	0.0082	UJ
TOXAPHENE	NDW06SD15	0.41	UJ
	NDW06SD16	0.42	UJ
Polychlorinated Biphenyls (mg/Kg)			
PCB-1016 (AROCLOR 1016)	NDW06SD15	0.08	U
	NDW06SD16	0.082	U
PCB-1221 (AROCLOR 1221)	NDW06SD15	0.16	U
	NDW06SD16	0.17	U
PCB-1232 (AROCLOR 1232)	NDW06SD15	0.08	U
	NDW06SD16	0.082	U
PCB-1242 (AROCLOR 1242)	NDW06SD15	0.08	U
	NDW06SD16	0.082	U
PCB-1248 (AROCLOR 1248)	NDW06SD15	0.08	U
	NDW06SD16	0.082	U
PCB-1254 (AROCLOR 1254)	NDW06SD15	0.08	U
	NDW06SD16	0.082	U
PCB-1260 (AROCLOR 1260)	NDW06SD15	0.08	U
	NDW06SD16	0.082	U

U indicates that the chemical was not detected. The reported value is the minimum detection limit (MDL, inorganics) or the reporting limit (RL, organics).

UJ indicates that the chemical was not detected and the quantitation limit may be inaccurate or imprecise.

J indicates that the chemical was detected. The reported value is estimated.

= indicates that the chemical was detected. The reported value is the measured concentration.

TABLE 4-4
Essential Nutrients in Soil
SWMU 6, Naval Ammunition Support Detachment
SWMU 6 Former NASD, Vieques Island, Puerto Rico

Chemical	Maximum Concentration in Surface Soil (mg/Kg)	Background Concentration [1] (mg/Kg)	Daily Soil Intake [2] (kg/day)		Daily Nutrient Intake from Soil [3] (mg/day)		Recommended Daily Nutrient Intake [4] (mg/day)		Percent of Recommended Daily Nutrient Intake from Soil Consumption	
			Child	Adult	Child	Adult	Child	Adult	Child	Adult
Calcium	165000	210,000	0.0002	0.0001	33.00	16.50	600	1000	5.5%	1.7%
Magnesium	9050	12,834	0.0002	0.0001	1.81	0.91	105	300	1.7%	0.30%
Potassium	2890	1,700	0.0002	0.0001	0.578	0.29	1,050	2,000	0.06%	0.01%
Sodium	14200	6,300	0.0002	0.0001	2.840	1.42	260	500	1.1%	0.28%

[1] Final Soil, Groundwater, Surface Water, and Sediment Background Investigation Report (CH2M Hill, 2002).
[2] Soil intake is 200 mg/day for a child and 100 mg/day for an adult.
[3] Calculated value.
[4] Median value from the Recommended Dietary Allowances, 10th Edition, National Academy of Sciences, National Research Council, Food and Nutrition Board, 1989.

TABLE 4-5
Chemicals Detected Above Screening Criteria and Background Levels in Surface Soil
SWMU 6, Naval Ammunition Support Detachment
SWMU 6 Former NASD, Vieques Island, Puerto Rico

Chemical	Station ID	Sample Date	Result	Qualifer	Region IX PRG [1]	Ecological Criteria [2]	SSL [3] (DAF=10)	Screening Criteria Exceedances PRG	Ecological	SSL
Metals (mg/Kg)										
ANTIMONY	NDW06SS01	04/24/00	13.3	J	3.13	5	2.5	yes	yes	yes
	NDW06SS13	08/28/03	2.96	J				no	no	yes
ARSENIC	NDW06SS23	08/28/03	7.9	J	0.39	10	14.5	yes	no	no
	NDW06SS01	04/24/00	7.6	=				yes	no	no
	NDW06SS13	08/28/03	3.09	J				yes	no	no
COPPER	NDW06SS13	08/28/03	275	=	313	50	NA	no	yes	na
	NDW06SS05	04/24/00	250	=				no	yes	na
	NDW06SS01	04/24/00	121	=				no	yes	na
	NDW06SS06	04/20/00	114	J				no	yes	na
	NDW06SS08	04/20/00	114	J				no	yes	na
	NDW06SS23	08/28/03	86.7	=				no	yes	na
IRON	NDW06SS23	08/28/03	93200	=	2350	200	NA	yes	yes	na
	NDW06SS01	04/24/00	80000	=				yes	yes	na
LEAD	NDW06SS01	04/24/00	617	=	400	50	NA	yes	yes	na
	NDW06SS23	08/28/03	397	=				no	yes	na
	NDW06SS13	08/28/03	334	=				no	yes	na
	NDW06SS03	04/24/00	104	=				no	yes	na
	NDW06SS19	08/28/03	87.8	=				no	yes	na
	NDW06SS05	04/24/00	67.5	=				no	yes	na
THALLIUM	NDW06SS01	04/24/00	4.3	=	0.516	1	NA	yes	yes	na
	NDW06SS05	04/24/00	0.82	J				yes	no	na
	NDW06SS04	04/24/00	0.77	J				yes	no	na
ZINC	NDW06SS01	04/24/00	438	=	2350	50	6000	no	yes	no
	NDW06SS23	08/28/03	389	=				no	yes	no
	NDW06SS13	08/28/03	357	=				no	yes	no
	NDW06SS05	04/24/00	138	=				no	yes	no
	NDW06SS09	08/28/03	127	=				no	yes	no
	NDW06SS19	08/28/03	99.1	=				no	yes	no
	NDW06SS06	04/20/00	96.5	=				no	yes	no
	NDW06SS04	04/24/00	86.3	=				no	yes	no
	NDW06SS08	04/20/00	83.7	=				no	yes	no
	NDW06SS03	04/24/00	82.2	=				no	yes	no

TABLE 4-5
Chemicals Detected Above Screening Criteria and Background Levels in Surface Soil
SWMU 6, Naval Ammunition Support Detachment
SWMU 6 Former NASD, Vieques Island, Puerto Rico

Chemical	Station ID	Sample Date	Result	Qualifer	Region IX PRG [1]	Ecological Criteria [2]	SSL [3] (DAF=10)	Screening Criteria Exceedances PRG	Ecological	SSL
Volatile Organic Compounds (mg/Kg)										
Semivolatile Organic Compounds (mg/Kg)										
ANTHRACENE	NDW06SS05	04/24/00	0.902	=	2190	0.1	6000	no	yes	no
BENZO(a)ANTHRACENE	NDW06SS05	04/24/00	1.87	=	0.621	NA	1	yes	na	yes
BENZO(a)PYRENE	NDW06SS05	04/24/00	1.51	=	0.0621	0.1	4	yes	yes	no
	NDW06SS13	08/28/03	0.925	=				yes	yes	no
	NDW06SS12	08/28/03	0.22	J				yes	yes	no
	NDW06SS18	08/28/03	0.136	J				yes	yes	no
	NDW06SS08	04/20/00	0.081	J				yes	no	no
BENZO(b)FLUORANTHENE	NDW06SS05	04/24/00	1.8	=	0.621	NA	2.5	yes	na	no
BENZO(g,h,i)PERYLENE	NDW06SS13	08/28/03	1.16	=	2300	1	NA	no	yes	na
CARBAZOLE	NDW06SS05	04/24/00	0.431	J	24.3	NA	0.3	no	na	yes
DIBENZ(a,h)ANTHRACENE	NDW06SS13	08/28/03	0.345	J	0.0621	NA	1	yes	na	no
	NDW06SS05	04/24/00	0.254	J				yes	na	no
FLUORANTHENE	NDW06SS05	04/24/00	4.06	=	229	0.1	2150	no	yes	no
	NDW06SS18	08/28/03	0.445	J				no	yes	no
	NDW06SS13	08/28/03	0.3	J				no	yes	no
	NDW06SS12	08/28/03	0.268	J				no	yes	no
INDENO(1,2,3-c,d)PYRENE	NDW06SS13	08/28/03	1.13	=	0.621	NA	7	yes	na	no
	NDW06SS05	04/24/00	0.653	=				yes	na	no
NAPHTHALENE	NDW06SS05	04/24/00	0.621	=	5.59	0.1	42	no	yes	no
PHENANTHRENE	NDW06SS05	04/24/00	4.86	=	NA	0.1	NA	na	yes	na
	NDW06SS13	08/28/03	0.272	J				na	yes	na
PYRENE	NDW06SS05	04/24/00	2.9	=	232	0.1	2100	no	yes	no
	NDW06SS13	08/28/03	0.603	=				no	yes	no
	NDW06SS18	08/28/03	0.372	J				no	yes	no
	NDW06SS12	08/28/03	0.258	J				no	yes	no
Pesticides (mg/Kg)										
p,p'-DDD	NDW06SS13	08/28/03	0.028	J	2.44	0.0025	8	no	yes	no
	NDW06SS08	04/20/00	0.013	J				no	yes	no
	NDW06SS01	04/24/00	0.011	J				no	yes	no
	NDW06SS23	08/28/03	0.0042	J				no	yes	no
p,p'-DDE	NDW06SS06	04/20/00	0.074	J	1.72	0.0025	27	no	yes	no

TABLE 4-5
Chemicals Detected Above Screening Criteria and Background Levels in Surface Soil
SWMU 6, Naval Ammunition Support Detachment
SWMU 6 Former NASD, Vieques Island, Puerto Rico

Chemical	Station ID	Sample Date	Result	Qualifer	Region IX PRG [1]	Ecological Criteria [2]	SSL [3] (DAF=10)	Screening Criteria Exceedances PRG	Ecological	SSL
	NDW06SS08	04/20/00	0.046	J				no	yes	no
	NDW06SS01	04/24/00	0.029	J				no	yes	no
	NDW06SS13	08/28/03	0.023	J				no	yes	no
	NDW06SS23	08/28/03	0.018	J				no	yes	no
	NDW06SS05	04/24/00	0.0075	J				no	yes	no
	NDW06SS03	04/24/00	0.0067	J				no	yes	no
	NDW06SS02	04/24/00	0.0038	J				no	yes	no
	NDW06SS12	08/28/03	0.0028	J				no	yes	no
p,p'-DDT	NDW06SS06	04/20/00	0.017	J	1.72	0.0025	16	no	yes	no
	NDW06SS13	08/28/03	0.0092	J				no	yes	no
	NDW06SS01	04/24/00	0.0072	J				no	yes	no
	NDW06SS08	04/20/00	0.007	J				no	yes	no
	NDW06SS03	04/24/00	0.003	J				no	yes	no
Polychlorinated Biphenyls (mg/Kg)										

[1] USEPA Region IX PRG (EPA,2002d) based on a hazard index (HI) of 0.1 for non-carcinogens.

[2] The lower of the toxicological benchmarks terrestrial plants, (Efroymson, 1997a) or invertebrates and heterotrophs (Efroymson, 1997b).

[3] USEPA Region IX PRG soil screening level (SSL, 2002) based on a dilution attenuation factof (DAF) of 10.

ND indicates that the chemical was not detected.

NA indicates that the information is not available or not applicable.

J indicates that the chemical was detected. The reported value is estimated.

= indicates that the chemical was detected. The reported value is the measured concentration.

TABLE 4-6

Chemicals Detected Above Screening Criteria and Background Levels in Subsurface Soil
SWMU 6, Naval Ammunition Support Detachment
SWMU 6 Former NASD, Vieques Island, Puerto Rico

Chemical	Station ID	Sample Date	Result	Qualifier	SSL [1] (DAF=10)	Exceedances of SSL
Metals (mg/Kg)						
ANTIMONY	NDW06SB01	04/24/00	4.1	J	2.5	yes
Volatile Organic Compounds (mg/Kg)						
Semivolatile Organic Compounds (mg/Kg)						
Pesticides (mg/Kg)						

[1] USEPA Region IX PRG soil screening level (EPA, 2002d) based on a dilution attenuation factof (DAF) of 10.

ND indicates that the chemical was not detected.

NA indicates that the information is not available or not applicable.

J indicates that the chemical was detected. The reported value is estimated.

= indicates that the chemical was detected. The reported value is the measured concentration.

* - Lead concentrations above ecological screening criteria (50 mg/kg) are retained, though no SSLs are identified

TABLE 4-7
Chemicals Detected Above Screening Criteria and Background Levels in Groundwater
SWMU 6, Naval Ammunition Support Detachment
SWMU 6 Former NASD, Vieques Island, Puerto Rico

Chemical	Station ID	Sample Date	Concentration				Region IX PRG [1]	PRG Exceedances	
			Total	Qualifer	Dissolved	Qualifer		Total	Dissolved
Metals (ug/L)									
ANTIMONY	NDW06MW03	09/05/03	104	J	ND		1.46	yes	no
	NDW06MW05	09/05/03	73.3	J	ND			yes	no
	NDW06MW02	09/05/03	51.8	J	ND			yes	no
	NDW06MW06	09/05/03	35.5	J	ND			yes	no
ARSENIC	NDW06MW05	09/05/03	152	J	ND		0.0448	yes	no
	NDW06MW06	09/05/03	120	=	30.3	J		yes	yes
	NDW06MW02	09/05/03	51.7	J	25.2	J		yes	yes
	NDW06MW01	09/05/03	30.4	J	23.6	J		yes	yes
	NDW06MW04	05/02/00	10	=	13.3	=		yes	yes
	NDW06MW01	05/02/00	6.8	J	7.3	J		yes	yes
	NDW06MW03	05/02/00	6.5	J	5.9	J		yes	yes
	NDW06MW02	05/02/00	3.5	J	4.8	J		yes	yes
CADMIUM	NDW06MW05	09/05/03	14.2	J	ND		1.82	yes	no
	NDW06MW06	09/05/03	6.77	J	ND			yes	no
	NDW06MW01	05/02/00	3.3	J	2.9	J		yes	yes
	NDW06MW03	05/02/00	2.8	J	2	J		yes	yes
	NDW06MW04	05/02/00	2.8	J	2	J		yes	yes
	NDW06MW02	05/02/00	2	J	1.8	J		yes	no
CHROMIUM, TOTAL	NDW06MW05	09/05/03	58.8	J	ND		11	yes	no
	NDW06MW06	09/05/03	37.4	J	9.19	J		yes	no
	NDW06MW04	09/07/03	ND		19.8	J		no	yes
IRON	NDW06MW03	09/05/03	6090	J	5230	J	1090	yes	yes
LEAD	NDW06MW06	09/05/03	134	=	ND		15	yes	no
	NDW06MW02	09/05/03	97	=	210	J		yes	yes
	NDW06MW05	09/05/03	71	J	260	J		yes	yes
	NDW06MW01	09/05/03	62.2	=	218	J		yes	yes
	NDW06MW03	09/05/03	41	=	ND			yes	no
	NDW06MW02	05/02/00	25.2	=	2.7	J		yes	no
SELENIUM	NDW06MW06	09/05/03	191	=	ND		18.2	yes	no
	NDW06MW02	09/05/03	133	=	ND			yes	no
	NDW06MW05	09/05/03	127	J	253	J		yes	yes

TABLE 4-7
Chemicals Detected Above Screening Criteria and Background Levels in Groundwater
SWMU 6, Naval Ammunition Support Detachment
SWMU 6 Former NASD, Vieques Island, Puerto Rico

Chemical	Station ID	Sample Date	Concentration				Region IX PRG [1]	PRG Exceedances	
			Total	Qualifer	Dissolved	Qualifer		Total	Dissolved
	NDW06MW03	09/05/03	103	=	258	J		yes	yes
	NDW06MW01	09/05/03	93.1	=	ND			yes	no
SILVER	NDW06MW05	09/05/03	56.4	J	ND		18.2	yes	no
THALLIUM	NDW06MW05	09/05/03	60.4	J	ND		0.241	yes	no
	NDW06MW04	09/07/03	56.5	J	ND			yes	no
Volatile Organic Compounds (ug/L)									
CHLOROFORM	NDW06MW01	09/05/03	1.1	=	-		0.617	yes	na
Semivolatile Organic Compounds (ug/L)									
Polychlorinated Biphenyls (ug/L)									
PCB-1221 (AROCLOR 1221	NDW06MW04	05/02/00	0.7	=	-		0.0336	yes	na
PCB-1232 (AROCLOR 1232	NDW06MW04	05/02/00	0.09	J	-		0.0336	yes	na
Perchlorate (ug/L)									
Perchlorate	NDW06MW01	09/05/03	12.8	J	-		0.365	yes	na

[1] USEPA Region IX tap water PRG (EPA, 2002d) based on a hazard index (HI) of 0.1 for non-carcinogens.

ND indicates that the chemical was not detected.

NA indicates that the information is not available or not applicable.

J indicates that the chemical was detected. The reported value is estimated.

= indicates that the chemical was detected. The reported value is the measured concentration.

TABLE 4-8
Chemicals Detected Above Screening Criteria and Background Levels in Surface Water
SWMU 6, Naval Ammunition Support Detachment
SWMU 6 Former NASD, Vieques Island, Puerto Rico

Chemical	Station ID	Sample Date	Concentration				Ecological Criteria [1]	ECO Exceedances	
			Total	Qualifer	Dissolved	Qualifer		Total	Dissolved
Metals (ug/L)									
ARSENIC	NDW06SW02	04/13/00	3.8	J	-		1.4	yes	na
	NDW06SW05A	04/13/00	5	J	-			yes	na
	NDW06SW06A	04/13/00	5.3	J	-			yes	na
COPPER	NDW06SW02	04/13/00	4.6	J	-		3.7	yes	na
	NDW06SW06A	04/13/00	5	J	-			yes	na
	NDW06SW06B	09/29/03	23.7	J	ND		3.7	yes	no
	NDW06SW07B	09/29/03	38.9	J	ND			yes	no
LEAD	NDW06SW06A	04/13/00	14.7	=	-		8.1	yes	na
MERCURY	NDW06SW03A	04/13/00	1.6	J	-		0.051	yes	na
SILVER	NDW06SW05A	04/13/00	7.1	J	-		1.9	yes	na
Semivolatile Organic Compounds (ug/L)									

[1] The lower of the USEPA National Recommended Water Quality Criteria (EPA, 2002d) and the Puerto Rico Environmental Quality Board (EQB) Water Quality Standards.

ND indicates that the chemical was not detected.

NA indicates that the information is not available or not applicable.

J indicates that the chemical was detected. The reported value is estimated.

= indicates that the chemical was detected. The reported value is the measured concentration.

TABLE 4-9
Chemicals Detected Above Screening Criteria and Background Levels in Sediment
SWMU 6, Naval Ammunition Support Detachment
SWMU 6 Former NASD, Vieques Island, Puerto Rico

Chemical	Station ID	Sample Date	Result	Qualifer	Ecological Criteria [1]	Exceedances of ECO
Metals (mg/Kg)						
ANTIMONY	NDW06SD02	04/13/00	97.8	J	12	yes
ARSENIC	NDW06SD02	04/13/00	555	=	7.24	yes
	NDW06SD08	09/04/03	13.5	J		yes
	NDW06SD07B	09/04/03	8.78	J		yes
BARIUM	NDW06SD02	04/13/00	571	=	20	yes
CADMIUM	NDW06SD02	04/13/00	13.7	=	1.2	yes
COPPER	NDW06SD02	04/13/00	101	=	18.7	yes
	NDW06SD10	09/04/03	82.4	=		yes
	NDW06SD11	09/03/03	41.5	=		yes
	NDW06SD03A	04/13/00	37.8	=		yes
	NDW06SD12	09/04/03	37.4	=		yes
	NDW06SD05A	04/13/00	34.4	=		yes
	NDW06SD04	04/13/00	29.8	=		yes
	NDW06SD05B	09/03/03	29.8	J		yes
	NDW06SD07A	04/13/00	28.9	=		yes
	NDW06SD07B	09/04/03	26.4	J		yes
LEAD	NDW06SD02	04/13/00	144	=	30.2	yes
	NDW06SD10	09/04/03	95.5	=		yes
MERCURY	NDW06SD02	04/13/00	0.21	J	0.13	yes
	NDW06SD01	04/13/00	0.18	J		yes
NICKEL	NDW06SD02	04/13/00	143	=	15.9	yes
SILVER	NDW06SD02	04/13/00	14.5	=	2	yes
ZINC	NDW06SD10	09/04/03	241	=	124	yes
	NDW06SD02	04/13/00	173	=		yes
Volatile Organic Compounds (mg/Kg)						
Semivolatile Organic Compounds (mg/Kg)						
bis(2-ETHYLHEXYL) PHTHALATE	NDW06SD05B	09/03/03	0.446	J	0.182	yes
	NDW06SD03B	09/03/03	0.284	J		yes
Pesticides (mg/Kg)						
p,p'-DDD	NDW06SD13	09/03/03	0.67	J	0.0033	yes
	NDW06SD12	09/04/03	0.0035	J		yes

TABLE 4-9

Chemicals Detected Above Screening Criteria and Background Levels in Sediment
SWMU 6, Naval Ammunition Support Detachment
SWMU 6 Former NASD, Vieques Island, Puerto Rico

Chemical	Station ID	Sample Date	Result	Qualifer	Ecological Criteria [1]	Exceedances of ECO
p,p'-DDE	NDW06SD13	09/03/03	0.41	J	0.0033	yes
	NDW06SD10	09/04/03	0.0036	J		yes
	NDW06SD12	09/04/03	0.0036	J		yes
p,p'-DDT	NDW06SD05B	09/03/03	0.0086	J	0.0033	yes

[1] The lower of the screening criteria for marine and estuarine sediments (Long et.al. 1995) or the USEPA guidance on Ecological Risk Assessment (EPA, 2000a).

ND indicates that the chemical was not detected.

NA indicates that the information is not available or not applicable.

J indicates that the chemical was detected. The reported value is estimated.

= indicates that the chemical was detected. The reported value is the measured concentration.

Table 4-10
Summary of Surface Soil COPCs
SWMU 6, Naval Ammunition Support Detachment
SWMU 6 Former NASD, Vieques Island, Puerto Rico

Chemical	Number Analyzed	Number Detected	Maximum Detect (mg/Kg)	Minimum Detect (mg/Kg)	Mean Concentration [1] (mg/Kg)	Residential PRG [2]	Ecologic Screening Value [3]	Leaching Screening Value [4]	Background Concentration [5] (mg/Kg)
ANTIMONY	23	19	13.3	0.174	1.22	**3.13**	**5**	**2.5**	**2.3**
ARSENIC	23	23	7.9	0.48	1.71	**0.39**	10	14.5	**2.2**
COPPER	23	23	275	5.21	57	313	**50**	na	**68**
IRON	23	23	93200	2960	18500	**2350**	**200**	na	**37531**
LEAD	23	23	617	3.58	78.5	**40**	**50**	na	**6.9**
THALLIUM	23	3	4.3	0.77	0.35	**0.516**	**1**	na	**0.67**
ZINC	23	23	438	12.6	97.9	2350	**50**	6000	**65**
ANTHRACENE	23	2	0.902	0.0845	0.283	2190	**0.1**	6000	NA
BENZO(a)ANTHRACENE	23	5	1.87	0.041	0.311	**0.621**	na	**1**	NA
BENZO(a)PYRENE	23	7	1.51	0.0417	0.308	**0.0621**	**0.1**	4	NA
BENZO(b)FLUORANTHENE	23	8	1.8	0.0287	0.302	**0.621**	na	2.5	NA
BENZO(g,h,i)PERYLENE	23	7	1.16	0.04	0.265	2300	**1**	na	NA
CARBAZOLE	23	1	0.431	0.431	0.268	24.3	**na**	**0.3**	NA
DIBENZ(a,h)ANTHRACENE	23	3	0.345	0.0517	0.258	**0.0621**	**na**	1	NA
FLUORANTHENE	23	7	4.06	0.0322	0.394	229	**0.1**	2150	NA
INDENO(1,2,3-c,d)PYRENE	23	6	1.13	0.05	0.286	**0.621**	**na**	7	NA
NAPHTHALENE	23	1	0.621	0.621	0.276	5.59	**0.1**	42	NA
PHENANTHRENE	23	4	4.86	0.0276	0.446	**na**	**0.1**	na	NA
PYRENE	23	9	2.9	0.033	0.344	232	**0.1**	2100	NA
p,p'-DDD	23	7	0.028	0.00062	0.00722	2.44	**0.0025**	8	NA
p,p'-DDE	23	12	0.074	0.00037	0.0134	1.72	**0.0025**	27	NA
p,p'-DDT	23	5	0.017	0.003	0.00754	1.72	**0.0025**	16	NA

[1] Mean concentration is based on 1/2 the detection limit for non-detects.

[2] USEPA Region IX PRG (2002) based on a hazard index (HI) of 0.1 for non-carcinogens.

[3] The lower of the toxicological benchmarks terrestrial plants, (Efroymson, 1997a) or invertebrates and heterotrophs (Efroymson, 1997b).

[4] USEPA Region IX PRG soil screening level (SSL, 2002) based on a dilution attenuation factof (DAF) of 10.

[5] Final Soil, Groundwater, Surface Water, and Sediment Background Investigation Report (CH2M Hill, 2002).

NA indicates that the information is not available or not applicable.

TABLE 4-11
Summary of Subsurface Soil COPCs
SWMU 6, Naval Ammunition Support Detachment
SWMU 6 Former NASD, Vieques Island, Puerto Rico

Chemical	Number Analyzed	Number Detected	Maximum Detect (mg/Kg)	Minimum Detect (mg/Kg)	Mean Concentration [1] (mg/Kg)	Leaching Screening Value [2]	Background Concentration [3] (mg/Kg)
ANTIMONY	8	5	4.1	0.46	0.863	**2.5**	**2.3**

[1] Mean concentration is based on 1/2 the detection limit for non-detects.

[2] USEPA Region IX PRG soil screening level (SSL, 2002) based on a dilution attenuation factof (DAF) of 20.

[3] Final Soil, Groundwater, Surface Water, and Sediment Background Investigation Report (CH2M Hill, 2002).

NA indicates that the information is not available or not applicable.

Table 4-12
Summary of Groundwater COPCs
SWMU 6, Naval Ammunition Support Detachment
SWMU 6 Former NASD, Vieques Island, Puerto Rico

Chemical	Number Analyzed	Number Detected	Maximum Detect (ug/L)	Minimum Detect (ug/L)	Mean Concentration [1] (ug/L)	Tap Water PRG [2]	Background Concentrations	
							Site-Specific [3] (ug/L)	Base-Wide [4] (ug/L)
ANTIMONY	10	5	104	3.7	30.8	**1.46**	**ND**	**5.2**
ANTIMONY, DISSOLVED	10	1	1.8	1.8	9.76	**1.46**	**ND**	9
ARSENIC	10	8	152	3.5	41.1	**0.0448**	**ND**	NA
ARSENIC, DISSOLVED	10	8	30.3	4.8	16.8	**0.0448**	**ND**	**5.5**
CADMIUM	10	6	14.2	2	4.08	**1.82**	**ND**	**1**
CADMIUM, DISSOLVED	10	4	2.9	1.8	2.2	**1.82**	**ND**	**1**
CHROMIUM, DISSOLVED	10	6	19.8	4.5	6.57	**15**	**19.3**	**6.8**
CHROMIUM, TOTAL	10	7	58.8	2.7	14.3	**15**	**16.2**	**5**
IRON	10	7	6090	43	1200	**1090**	**ND**	**4800**
IRON, DISSOLVED	7	4	5230	12.7	1180	**1090**	**ND**	**490**
LEAD	10	9	134	1.8	45.8	**15**	**ND**	NA
LEAD, DISSOLVED	10	7	260	2.6	89.8	**15**	**ND**	NA
SELENIUM	10	9	191	2.9	69.1	**18.2**	**76.7**	**2.3**
SELENIUM, DISSOLVED	10	6	258	5	95.4	**18.2**	**98.6**	NA
SILVER	10	3	56.4	6.71	8.62	**18.2**	**ND**	NA
SILVER, DISSOLVED	10	2	2.1	0.93	2.12	18.2	**ND**	NA
THALLIUM	10	2	60.4	56.5	17.3	**0.241**	**ND**	**18**
THALLIUM, DISSOLVED	10	0	0	0	67.2	0.241	**ND**	16
CHLOROFORM	10	2	1.1	0.53	0.463	**0.617**	NA	NA
PCB-1221 (AROCHLOR 1221)	11	1	0.7	0.7	0.226	**0.0336**	NA	NA
PCB-1232 (AROCHLOR 1232)	11	1	0.09	0.09	0.197	**0.0336**	NA	NA
Perchlorate	10	1	12.8	12.8	14.3	**0.365**	NA	NA

[1] Mean concentration is based on 1/2 the detection limit for non-detects.

[2] USEPA Region IX tap water PRG (2002) based on a hazard index (HI) of 0.1 for non-carcinogens.

[3] Maximum detected concentration from the site-specific background samples.

[4] Final Soil, Groundwater, Surface Water, and Sediment Background Investigation Report (CH2M Hill, 2002).

NA indicates that the information is not available or not applicable.

Table 4-13
Summary of Surface Water COPCs
SWMU 6, Naval Ammunition Support Detachment
SWMU 6 Former NASD, Vieques Island, Puerto Rico

Chemical	Number Analyzed	Number Detected	Maximum Detect (ug/L)	Minimum Detect (ug/L)	Mean Concentration [1] (ug/L)	Ecological Screening Criteria [2]	Background Concentration [3] (ug/L)
ARSENIC	14	3	5.3	3.8	11.7	**1.4**	**ND**
ARSENIC, DISSOLVED	7	0	0	0	20.4	1.4	**ND**
COPPER	14	7	38.9	1.9	9.91	**3.7**	**ND**
COPPER, DISSOLVED	7	0	0	0	11.7	3.1	**ND**
LEAD	14	4	14.7	1.2	10.3	**8.1**	**ND**
LEAD, DISSOLVED	7	0	0	0	17.6	8.1	**ND**
MERCURY	8	7	1.6	0.0172	0.215	**0.051**	**0.04**
MERCURY, DISSOLVED	7	6	0.0721	0.0241	0.0273	0.051	0.0561
NICKEL	14	2	1.1	0.96	5.26	8.2	**ND**
NICKEL, DISSOLVED	7	1	52	52	16	**8.2**	**ND**
SILVER	14	1	7.1	7.1	3.4	**1.9**	**ND**
SILVER, DISSOLVED	7	0	0	0	4.72	1.9	**ND**

[1] Mean concentration is based on 1/2 the detection limit for non-detects.

[2] The lower of the USEPA National Recommended Water Quality Criteria (EPA, 2002b) and the Puerto Rico Environmental Quality Board (EQB) Water Quality Standards.

[3] Maximum detected concentration from the site-specific background samples.

ND indicates that the chemical was not detected.

NA indicates that the information is not available or not applicable.

J indicates that the chemical was detected. The reported value is estimated.

= indicates that the chemical was detected. The reported value is the measured concentration.

Table 4-14
Summary of Sediment COPCs
SWMU 6, Naval Ammunition Support Detachment
SWMU 6 Former NASD, Vieques Island, Puerto Rico

Chemical	Number Analyzed	Number Detected	Maximum Detect (mg/Kg)	Minimum Detect (mg/Kg)	Mean Concentration [1] (mg/Kg)	Ecologic Screening Value [2]	Background Concentrations	
							Site-Specific [3] (mg/Kg)	Base-Wide [4] (mg/Kg)
ANTIMONY	19	15	97.8	0.307	5.67	**12**	**0.951**	**0.59**
ARSENIC	19	19	555	1.1	33.2	**7.24**	**1.49**	**1.5**
BARIUM	19	19	571	4.48	39	**20**	**4.24**	**69**
CADMIUM	19	12	13.7	0.0252	0.815	**1.2**	**0.128**	**0.14**
COPPER	19	19	101	2.87	30	**18.7**	**10.6**	**26**
LEAD	19	19	144	0.468	19.9	**30.2**	**3.07**	**8**
MERCURY	19	14	0.21	0.00265	0.0519	**0.13**	**0.0383**	**0.052**
NICKEL	19	19	143	0.666	11.8	**15.9**	**2.68**	**4.1**
SILVER	19	4	14.5	0.0386	0.814	**2**	**ND**	**0.3**
ZINC	14	14	241	12.9	67	**124**	**18.6**	**48**
bis(2-ETHYLHEXYL) PHTHALATE	19	6	0.446	0.119	0.446	**0.182**	NA	NA
p,p'-DDD	18	6	0.67	0.00026	0.0433	**0.0033**	NA	NA
p,p'-DDE	17	5	0.41	0.00081	0.0309	**0.0033**	NA	NA
p,p'-DDT	18	3	0.0086	0.00035	0.00419	**0.0033**	NA	NA

[1] Mean concentration is based on 1/2 the detection limit for non-detects.

[2] The lower of the screening criteria for marine and estuarine sediments (Long, 1995) or the USEPA guidance on Ecological Risk Assessment (USEPA, 2000).

[3] Maximum detected concentration from the site-specific background samples.

[4] Final Soil, Groundwater, Surface Water, and Sediment Background Investigation Report (CH2M Hill, 2002).

NA indicates that the information is not available or not applicable.

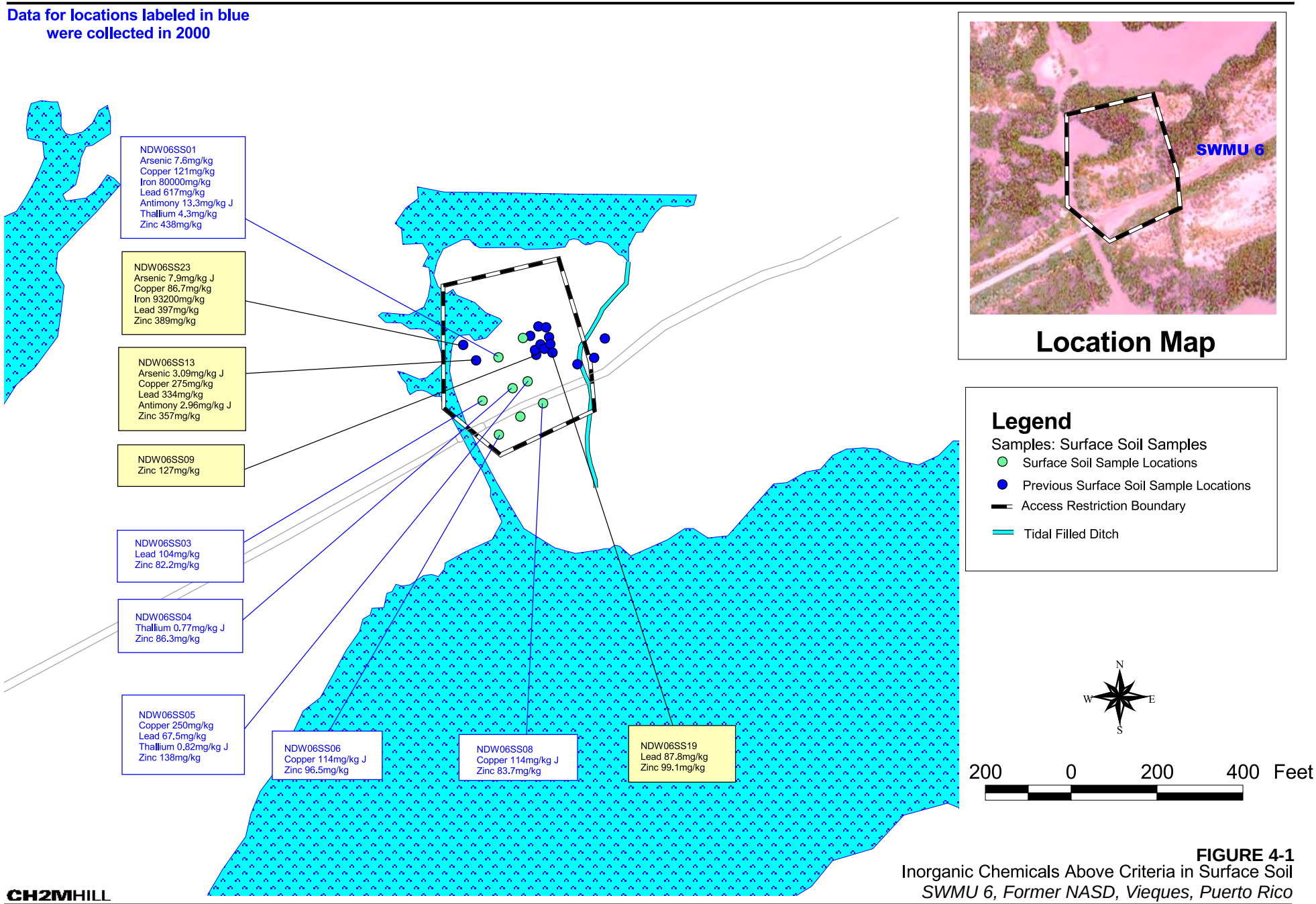


FIGURE 4-1
Inorganic Chemicals Above Criteria in Surface Soil
SWMU 6, Former NASD, Vieques, Puerto Rico

CH2MHILL

Data for locations labeled in blue were collected in 2000

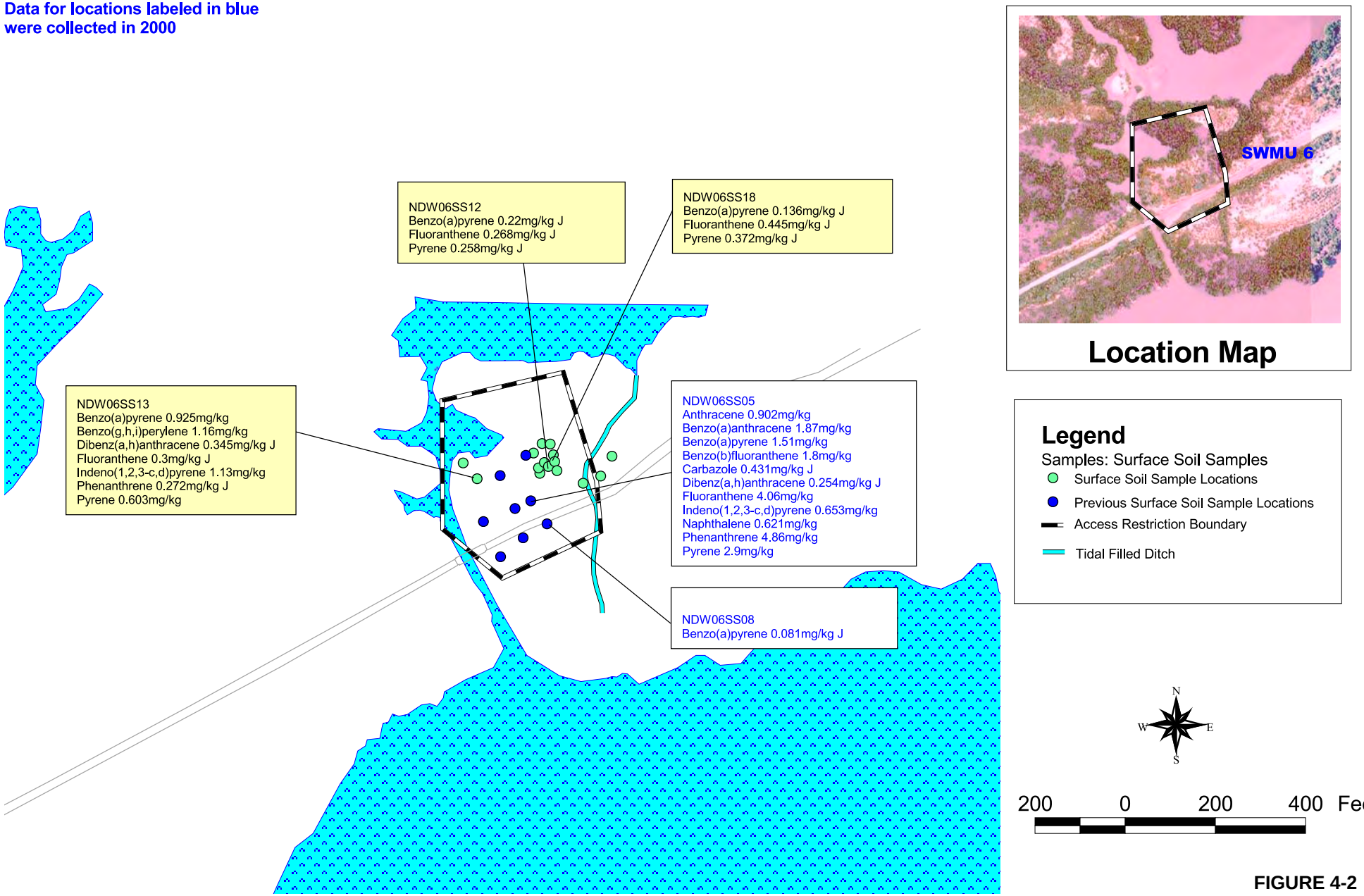
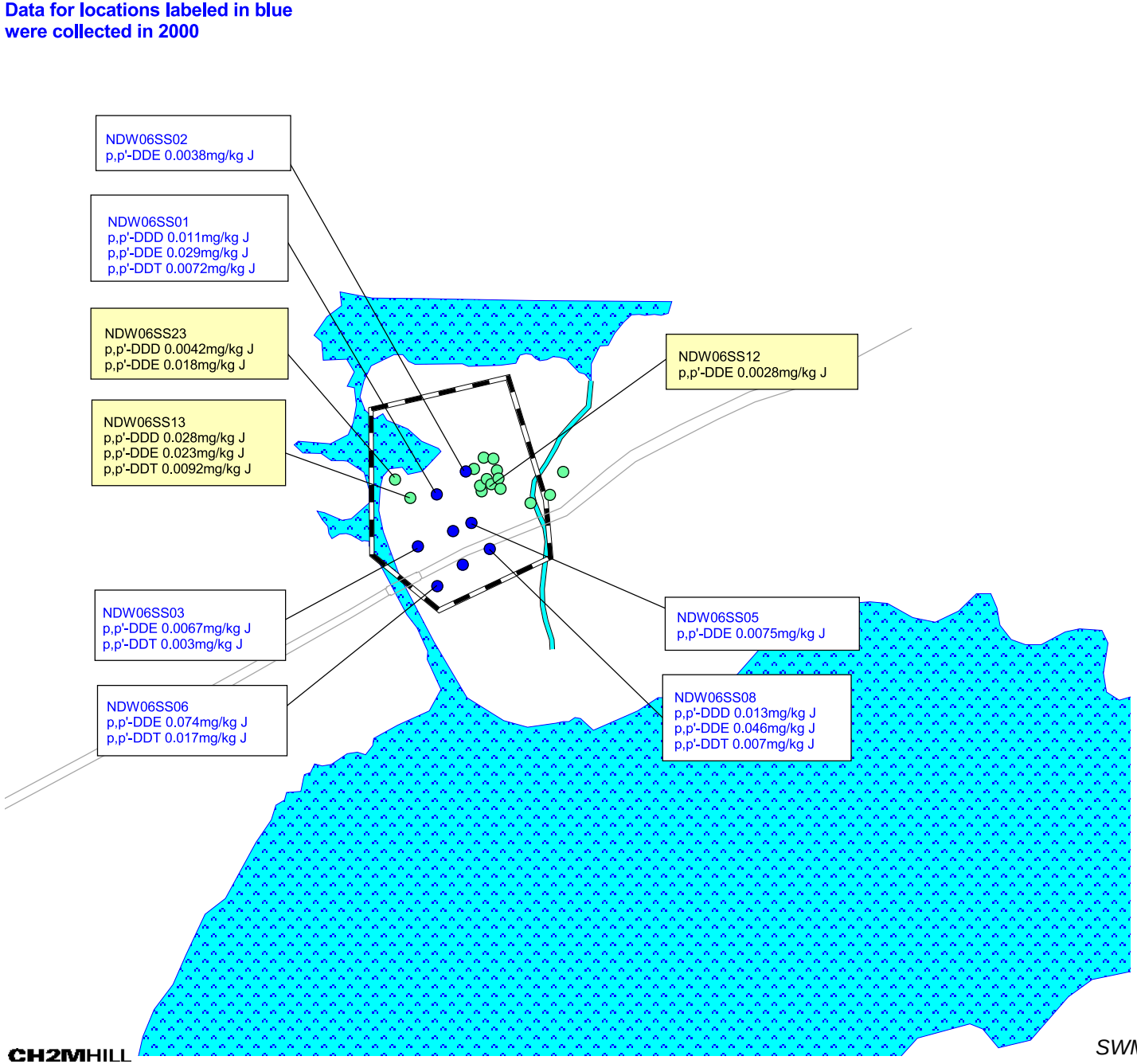
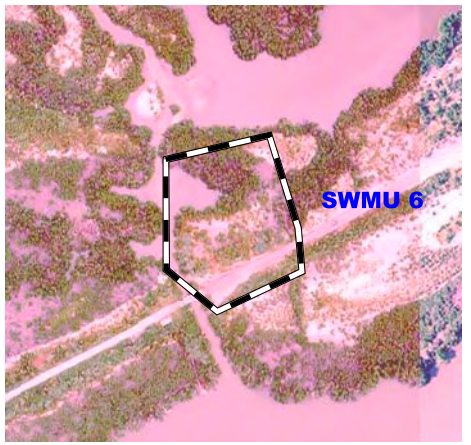


FIGURE 4-2
Semi-Volatile Chemicals Above Critera in Surface Soil
SWMU 6, Former NASD, Vieques, Puerto Rico

CH2MHILL

Data for locations labeled in blue were collected in 2000





Location Map

Legend

Samples: Surface Soil Samples

- Surface Soil Sample Locations
- Previous Surface Soil Sample Locations
- Access Restriction Boundary
- Tidal Filled Ditch

N
W E
S

200 0 200 400 Feet

FIGURE 4-3

Pesticides Above Critera in Surface Soil

SWMU 6, Former NASD, Vieques, Puerto Rico

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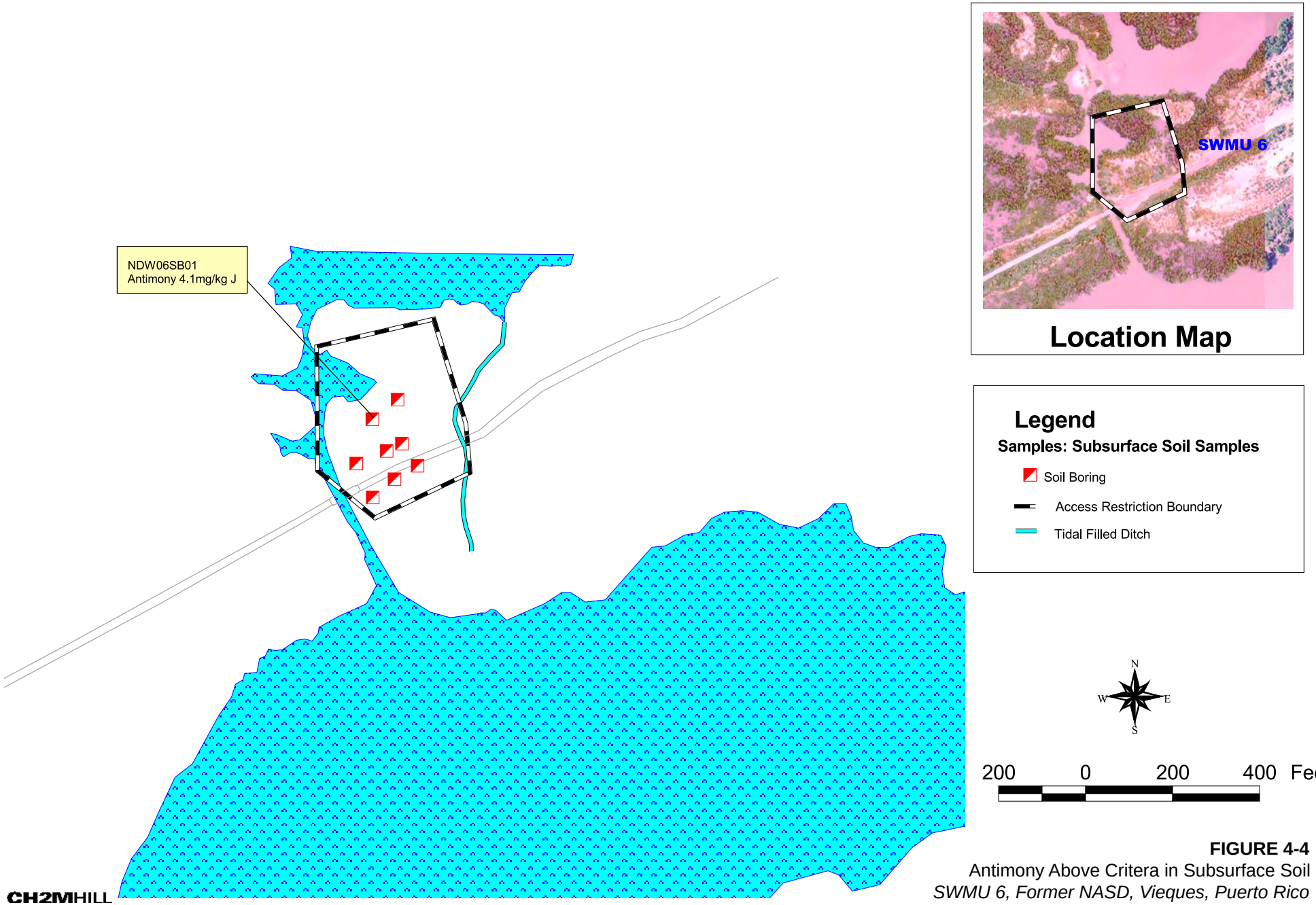


FIGURE 4-4
Antimony Above Critera in Subsurface Soil
SWMU 6, Former NASD, Vieques, Puerto Rico

CH2MHILL

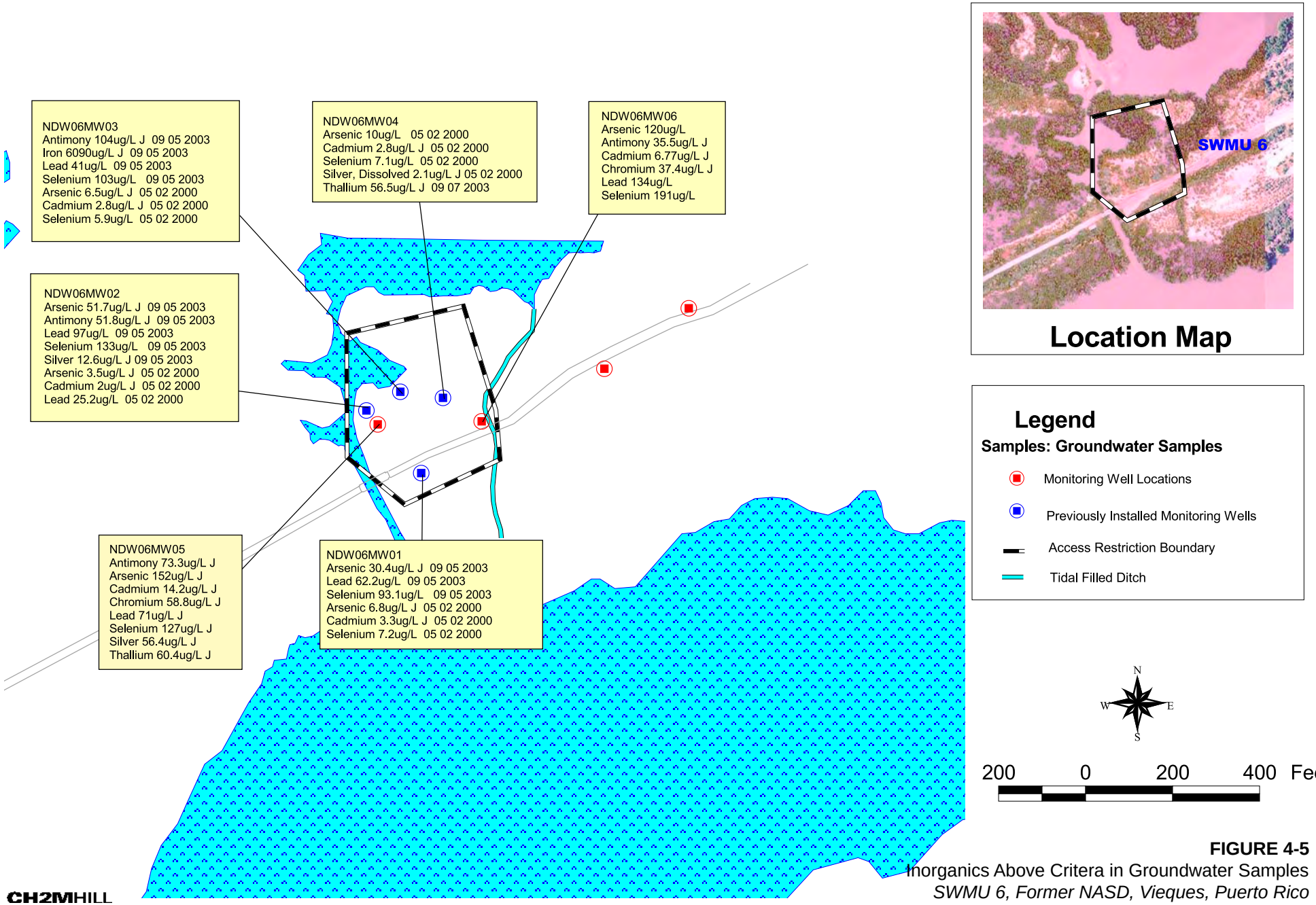
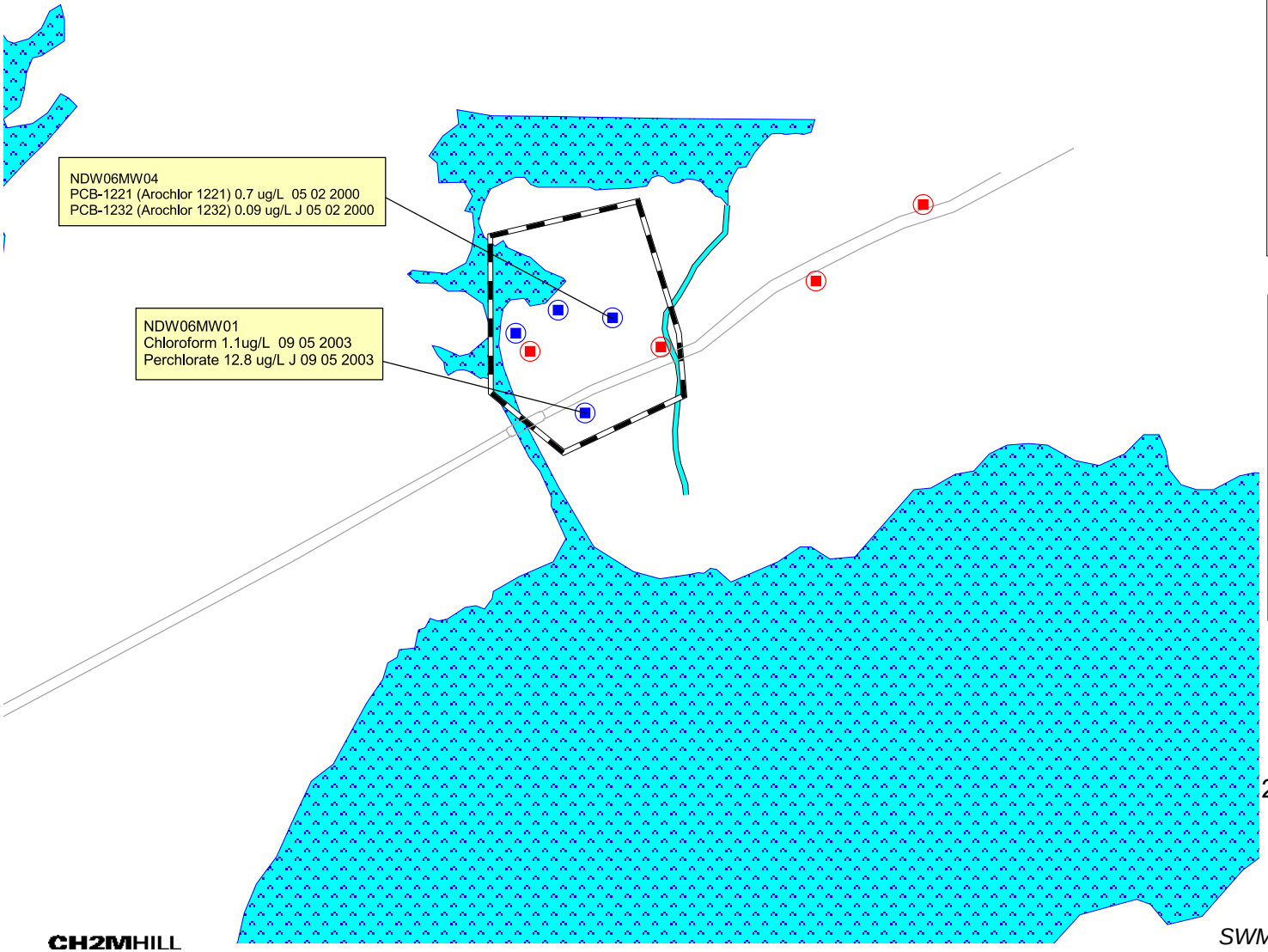
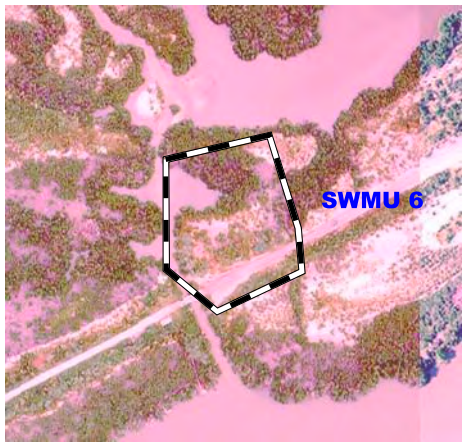


FIGURE 4-5
Inorganics Above Critera in Groundwater Samples
SWMU 6, Former NASD, Vieques, Puerto Rico

CH2MHILL





Location Map

Legend

Samples: Groundwater Samples

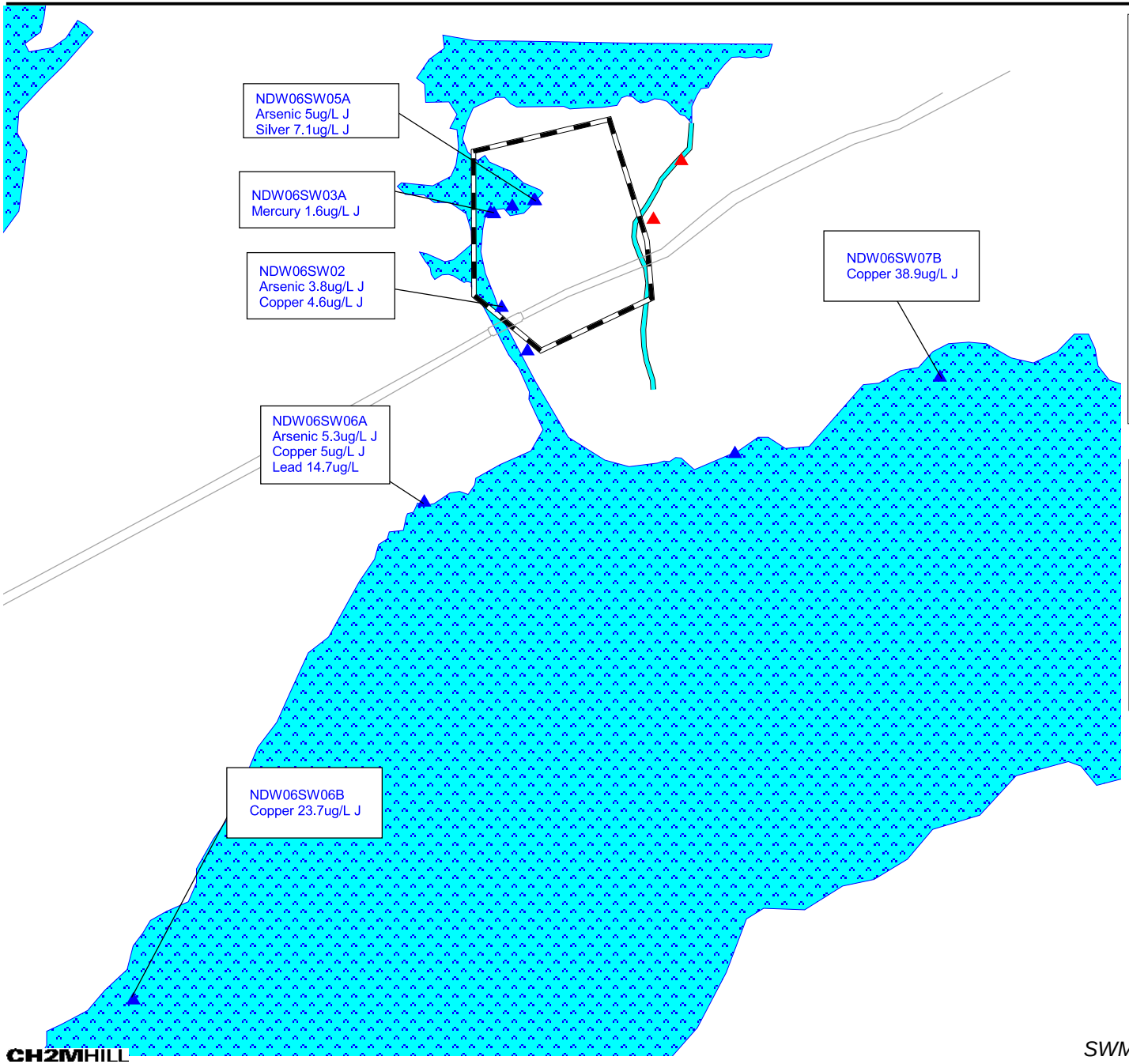
- Monitoring Well Locations
- Previously Installed Monitoring Wells
- Access Restriction Boundary
- Tidal Filled Ditch

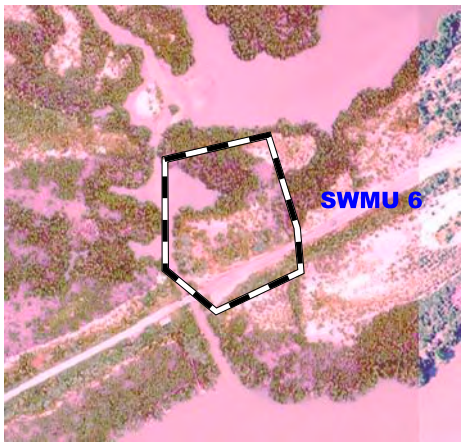
N
W E
S

200 0 200 400 Feet

FIGURE 4-6
Organic Chemicals Detected Above Critera in Groundwater Sampels
SWMU 6, Former NASD, Vieques, Puerto Rico

CH2MHILL





Location Map

Legend

Samples: Surface Water Samples

- Surface Water Sample Locations
- Previous Surface Water Sample Locations
  NDW06SW05A-Indicates Sampled in 2000
  NDW06SW05B-Indicates Sampled in 2003
- Access Restriction Boundary
- Tidal Filled Ditch

N
W E
S

200 0 200 400 Feet

FIGURE 4-7
Inorganics Above Critera in Surface Water
SWMU 6, Former NASD, Vieques, Puerto Rico

CH2MHILL

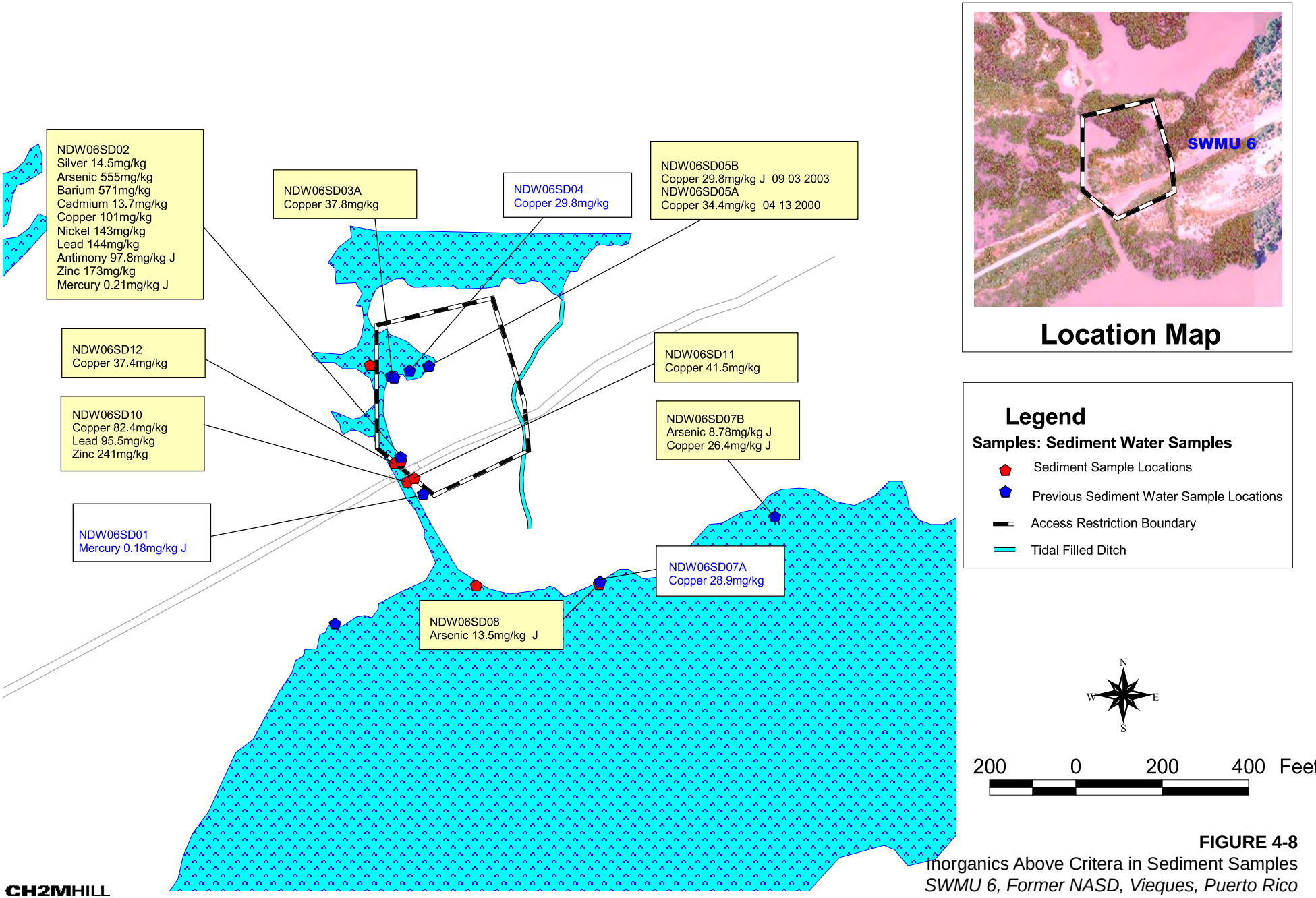
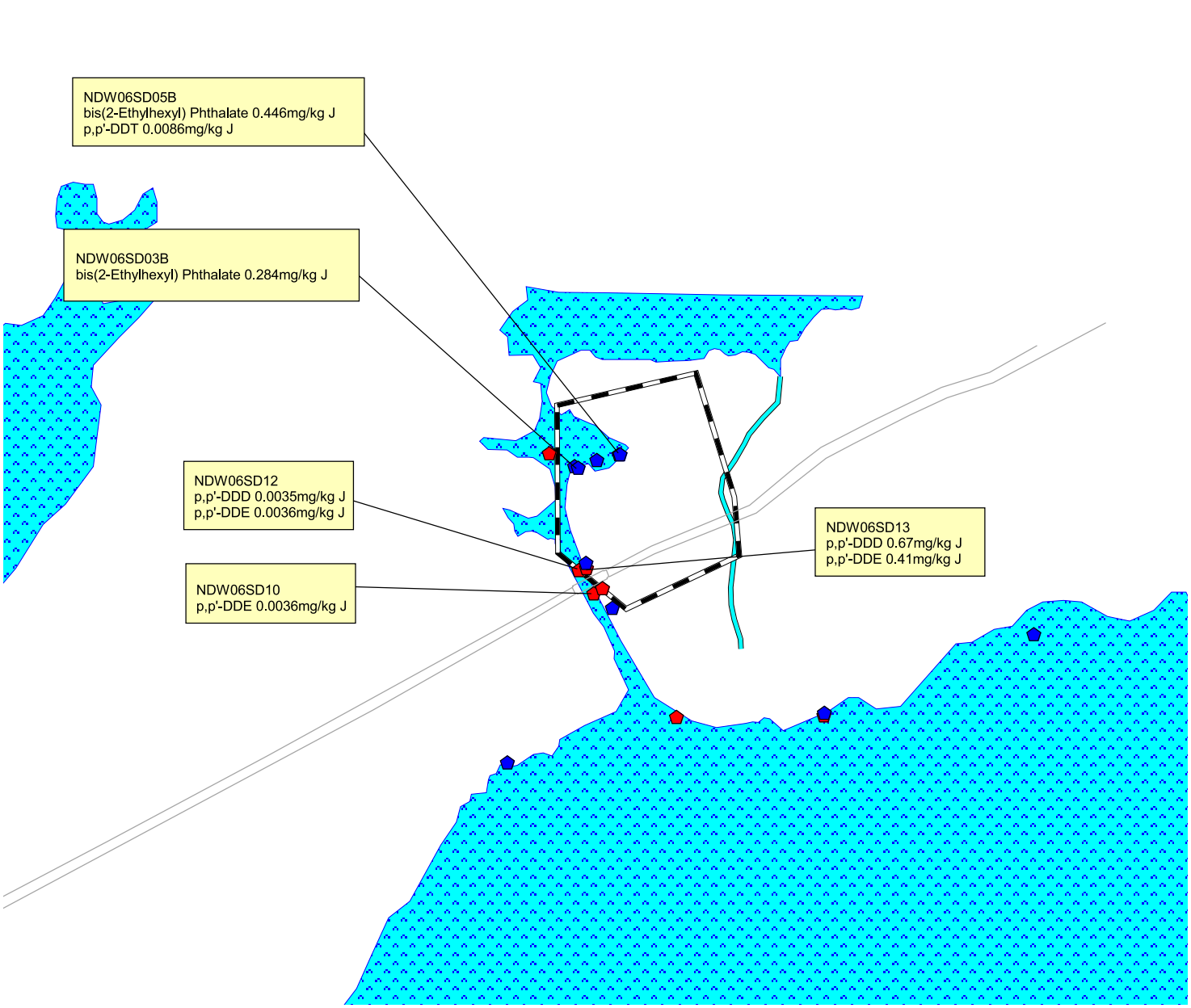
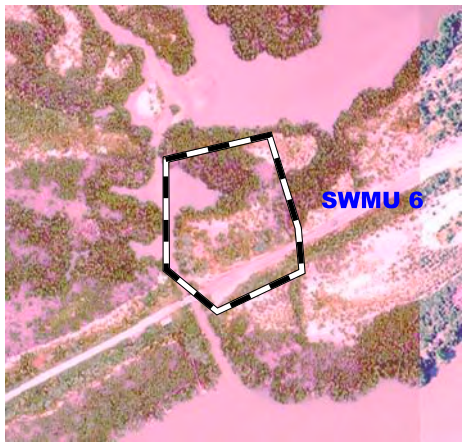


FIGURE 4-8
Inorganics Above Critera in Sediment Samples
SWMU 6, Former NASD, Vieques, Puerto Rico

CH2MHILL





Location Map

Legend

Samples: Sediment Water Samples

- Sediment Sample Locations
- Previous Sediment Water Sample Locations
- Access Restriction Boundary
- Tidal Filled Ditch

N
W E
S

200 0 200 400 Feet

FIGURE 4-9

Semi-Volatiles and Pesticides Above Critera in Sediment

SWMU 6, Former NASD, Vieques, Puerto Rico

SECTION 5

Contaminant Fate and Transport

This section presents a discussion of contaminant migration potential at SWMU 6 through an environmental contaminant fate and transport evaluation. The site physical characteristics, source characteristics, and extent of detected chemicals as presented in Sections 2, 3, and 4 were combined to form the basis of this section.

The CSM is also presented in this section and introduces the potential exposure pathways associated with the site. Factors that affect contaminant migration and chemical persistence are described. Finally, an assessment of contaminant migration patterns at the site is presented.

5.1 Potential Sources for Contamination

SWMU 6 was used by the former NASD for disposal of solid waste during the 1960s and 1970s. Waste discarded at the site included empty containers of lubricants, oil, solvents, and paints, broken glass, and rubble. No UXO/OE items were found at SWMU 6. However, munitions-related materials have been identified such as inert concrete-filled practice bombs, empty bomb dispensers, and empty shell casings.

A geophysical survey was conducted at SWMU 6 to delineate the extent of the buried waste, as described in Section 3. Most ferrous metal is present in the northern portion of the site and under the road of the surveyed area.

5.2 Conceptual Site Model

The CSM qualitatively defines the various contaminant sources, release mechanisms, relative rates of migration and persistence of contaminants, and migration pathways for contaminants at the site. Based on the available site information, a flow chart of the potential migration pathways, exposure pathways, potential human receptors, and ecological receptors was developed (Figure 5-1). The site is located in a national wildlife refuge. No human receptors currently are located at the site. The site is ecologically active, attracting lizards and birds. During site visits biologists noted that the site has land crab burrows and fiddler crabs. The crabs from the general vicinity of SWMU 6 were sampled by DOI (DOI, 2002). Vegetation at the site consists primarily of red and black mangroves; the mangrove communities are sparsely vegetated.

SWMU 6 is located in a relatively flat mangrove swamp. The site is just over 1 acre in area and is bounded to the west by a canal that connects Kiani Lagoon North and Kiani Lagoon South. Highway 200 extends east-west through the southern end of the site. A small water-filled ditch is near the eastern boundary of the site. The waste at the site extends approximately 100 to 120 feet north-northeast of Highway 200. A graphical representation of the CSM for SWMU 6 is presented as Figure 5-2.

The lithology at SWMU 6 consists of silty sand with organic material underlain by well-graded sand with crushed shells. Generally the subsurface soil is in a loose matrix and is very permeable. The maximum depth of the investigation was 15 feet bls. Chemicals identified as exceeding screening criteria in site soil include inorganics, VOCs, SVOCs, and pesticides. It is noted that because soil samples were not collected directly through the waste piles, there may be other chemicals present that exceed screening criteria. However, this uncertainty will be addressed by the removal action and associated confirmatory sampling protocol and residual risk assessment.

Kiani Lagoon North, Kiani Lagoon South, and the canal are directly connected to Vieques Passage. Water in the lagoons rises and falls with the tides and at times covers portions of the site. Based on the June 2003 hydraulic tidal study, the North Lagoon and South Lagoon stilling wells showed tidal fluctuations of approximately 0.7 foot and indicated a current flowing either north or south depending on the stage of the tidal cycle.

Groundwater at SWMU 6 exists in unconfined conditions. The depth to groundwater is approximately 1 to 2 feet bls. Within the site, local groundwater flow depends on tidal fluctuations. Based on the June 2003 hydraulic tidal study, groundwater at the site was observed to vary approximately 0.4 foot during tidal changes. During high tides, local groundwater flows to the southwest toward Kiani Lagoon South. During low tides, local groundwater flows to the northwest toward Kiani Lagoon North. This tidal influence on groundwater flow direction is expected to have an impact on groundwater quality at the site, causing an increase in salinity as surface (salt) water intermixes with groundwater. As noted in the Expanded PA/SI report, groundwater at the western edge of the site has a salinity similar to that of sea water.

The field data collected during the 2003 groundwater sampling are summarized in Table 5-1. These data, along with the dissolved metals data, indicate that the aquifer is likely under reducing conditions. The ORP values ranged from -261 to –319 millivolts (mV). Dissolved oxygen values were generally low in most wells. The high values of dissolved iron and manganese during the 2000 and 2003 sampling events suggest that significant iron and manganese reducing conditions commonly occur at the site. During the 2000 sampling event the field team noted hydrogen sulfide odor in all four wells during sampling, suggesting that sulfate reducing conditions may also occur in the aquifer. These observations are consistent with high levels of organic material observed to be present in the aquifer material and the low ORP field measurements and suggest that reducing conditions are prevalent at the site. Under reducing conditions, several ORP-sensitive metals such as iron, manganese, arsenic, antimony, and selenium are often found at elevated concentrations due to geochemical processes facilitated by groundwater bacteria.

5.3 Potential Routes of Migration

The primary mechanisms for contaminant transport from the source area at SWMU 6 are surface water runoff and vertical migration. The site is located within a wetlands area, and surface water may cover portions of the site during exceptionally high tides and storm events. Contaminants in soil and buried waste materials may leach through the vadose zone

and be transported into the groundwater system. Surface soil may also be released to the air by wind erosion.

5.3.1 Soil to Atmosphere Pathway

Wind erosion is considered a potential mechanism for release of site contaminants to the atmosphere from soil. Inorganics and many SVOCs and pesticides tend to bind to the soil and can be released to the atmosphere as dust during windy conditions. Since the site is located within a swamp, frequently wet soils and vegetation limit dust emissions. Therefore, this migration pathway is not considered significant.

Volatilization, a potential mechanism for releasing volatile contaminants from soil to the atmosphere, is not likely a significant part of potential contaminant release at the site. One VOC, naphthalene, in one surface soil sample exceeded screening criteria in soil at SWMU 6.

5.3.2 Surface Runoff Pathway

Contaminants in site soil may be transported by surface runoff to surface water and sediment in the canal, the small ditch on the eastern portion of the site, and possibly Kiani Lagoon. Contaminants can be transported in surface runoff either in the dissolved phase or as suspended particulates, which can then settle out into sediment. Generally the surface runoff pathway is most significant when flooding conditions occur on the site. The planned removal action will eliminate the waste and associated contaminated soil in order to address this potential contaminant migration pathway.

Inorganics are identified as exceeding screening criteria in surface water. Inorganics and four organics, bis(2-ethylhexyl)phthalate, DDD, DDE, and DDT, are identified as exceeding screening criteria in sediment.

5.3.3 Soil to Groundwater Pathway

Chemicals detected in soils may migrate through the soil column to the underlying shallow groundwater. Recharge to the aquifer primarily occurs through infiltration of surface water from the nearby water bodies and to a lesser extent rainfall. The movement of water through the unsaturated soil and buried waste can dissolve contaminants and strip them from waste materials, then transport them to the underlying groundwater, serving as a source of contaminants to groundwater. Some of the factors that influence this process include the mobility of the detected chemical, the nature of the soils, rainfall and other climatological factors, and depth to groundwater. The planned removal action will eliminate the waste and associated contaminated soil in order to address this potential contaminant migration pathway.

Chemicals identified as exceeding background levels and screening criteria in groundwater include inorganics (antimony, arsenic, cadmium, chromium, iron, lead, selenium, silver, and thallium), chloroform, PCBs, and perchlorate. Perchlorate and PCBs were detected in one monitoring well during one sampling event.

Chemicals identified in site soil that exceeded leachability screening criteria include antimony, chromium, benzo(a)anthracene, and carbazole. Benzo(a)anthracene and carbazole

exceeded the criteria in a single sample. Neither of these compounds was detected in groundwater.

5.4 Contaminant Persistence

The mobility and persistence of the potential contaminants at the site are determined by their physical, chemical, and biological interaction with the environment. Mobility is the potential for a chemical to migrate from a site, and persistence is a measure of how long a chemical will remain in the environment.

5.4.1 Physical and Chemical Properties of Contaminant Groups

Various basic physical and chemical properties affect the transport of chemicals in the environment at the site. In general, chemicals that are soluble, volatile, or leachable tend to be mobile. Mobile chemicals are likely to be released and transported from the source and are not persistent, while persistent chemicals tend to remain localized in the source area and are resistant to chemical and biological degradation reactions. Sorption, volatilization, degradation, transformation, and bioaccumulation are considered the most important properties.

5.4.1.1 Sorption

Sorption is the tendency for chemicals to adsorb to and desorb from materials in the media through which the contaminants are being transported. The subsurface materials likely to sorb chemicals typically are clay and organic material. In addition, inorganic chemicals adsorb onto iron, manganese, and aluminum oxyhydroxide or oxide coatings on soil and sediment grains. The conventional measure of sorption for a chemical is the soil-water distribution coefficient K_d. The K_d for organic chemicals is the product of a partition coefficient (K_{oc}) and the fraction of organic carbon (f_{oc}). In general, chemicals with a K_{oc} greater than 10,000 milliliters per gram (mL/g) (e.g., many SVOCs) have high degrees of adsorption and consequently low mobility, while chemicals with a K_{oc} lower than 1,000 mL/g (e.g., many VOCs) have lower degrees of adsorption and consequently higher mobility.

5.4.1.2 Volatilization

Volatilization is the tendency of some chemicals, particularly VOCs, to change from a liquid or adsorbed state to a gas. A conventional measure of volatility is Henry's Law Constant (H). Compounds with H values higher than 10^{-3} atmosphere-cubic meter per mole (atm-m^3/M) are expected to volatilize readily from water to air, whereas those with H values lower than 10^{-5} atm-m^3/M are relatively nonvolatile. Most inorganic chemicals are not volatile under normal temperature and pressure conditions.

5.4.1.3 Degradation

Degradation is the transformation of one chemical to another by such processes as hydrolysis, photolysis, and biodegradation. Hydrolysis is the reaction of a chemical with water, and photolysis is the result of exposing the chemical to light. Degradation is

commonly expressed as a half-life that combines the degradation by whatever processes may be operating.

5.4.1.4 Transformation

Transformation occurs when metals are increased or reduced in valence state by oxidation or reduction, respectively. Transformation may have a significant effect on the mobility of a metal, either increasing or decreasing it. Transformation can be caused by ORP and pH changes and by microbial or nonmicrobial (abiotic) processes.

5.4.1.5 Bioaccumulation

Bioaccumulation is the extent to which a chemical partitions from water into the lipophilic parts (e.g., fat) of an organism. Bioaccumulation commonly is estimated by the octanol-water partition coefficient, K_{ow}. Chemicals with high values of K_{ow} tend to avoid the aqueous phase and remain in soil longer or bioaccumulate in the lipid tissue of exposed organisms. Accumulation of a chemical in the tissue of the organism can be quantified by a bioconcentration factor (BCF), which is the ratio of the concentration of the chemical in the tissue to the concentration in the water. BCFs are both contaminant-specific and species-specific. Inorganic chemicals and SVOCs tend to have higher K_{ow} values, so they bioaccumulate more extensively than VOCs.

5.4.2 Fate and Transport of Contaminant Groups

Table 5-2 summarizes some of the relevant physical and chemical parameters for potential contaminants at SWMU 6. The fate and transport of chemicals exceeding screening criteria are discussed as groups (i.e., VOCs, SVOCs, pesticides, and inorganics) in the subsections below. It is recognized that there is uncertainty associated with the number and type of chemicals exceeding screening criteria in soil because soil samples were not collected directly through the waste piles. It is possible that additional contaminants or contaminants at higher concentrations would have been identified under those circumstances. However, as noted previously, this uncertainty will be addressed by the removal action and its robust characterization and confirmatory sampling protocol and residual risk assessments.

5.4.2.1 Volatile Organic Compounds

The only VOCs that exceeded screening criteria were chloroform in one groundwater sample and naphthalene in one surface soil sample.

Chloroform

Chloroform has a high mobility in soil due to a high water solubility and low soil adsorption coefficient. It tends to volatilize rapidly into the atmosphere from surface soil or leach into groundwater. Once in groundwater, chloroform may persist for a long time. In surface water, it tends to volatilize to the atmosphere and is not likely to sorb to sediment.

Aerobic and anaerobic biodegradation are important transformation processes for chlorinated aliphatic compounds in water systems and soil. The rate of biodegradation in soil depends on the soil type, substrate concentration, and ORP of the soil. In water, the biodegradation rate may be very slow compared to evaporation. Furthermore,

biodegradation of chloroform is usually possible only at low levels due to the compound's toxicity, and it may be inhibited by the presence of other chemicals (ATSDR, 1997). While chloroform does not appear to bioconcentrate in aquatic organisms, data for terrestrial plants and organisms are limited (ATSDR, 1997).

Naphthalene

One VOC, naphthalene, was detected in surface soil in a single sample above its ecological screening criteria. In its pure form, naphthalene is a white solid that evaporates easily. Fuels such as gasoline, diesel, and kerosene, as well as coal, contain naphthalene. Naphthalene is the simplest PAH, consisting of two aromatic rings, and it is often found in association with other PAHs.

Naphthalene evaporates easily. When it is near the surface of the soil, naphthalene evaporates readily. Naphthalene in water is destroyed by bacteria or evaporates. Most naphthalene is no longer present in rivers or lakes within two weeks. Naphthalene does not bind as strongly to soils and sediments as other PAHs with higher molecular weights. If present at high enough concentrations, it may leach to some degree to groundwater. In soil, microorganisms break down most of the naphthalene within one to three months. Naphthalene does not accumulate in the flesh of animals or fish.

5.4.2.2 Semivolatile Organic Compounds

Several SVOCs are identified as exceeding screening criteria in site media, including PAHs, carbazole, and bis(2-ethylhexyl)phthalate. Phthalates are common laboratory and field contaminants; therefore, the presence of bis(2-ethylhexyl)phthalate may not be site-related. SVOCs were primarily detected in surface soil. No SVOCs are identified as exceeding screening criteria in subsurface soil, surface water, or groundwater.

Carbazole

Carbazole is used as an intermediate in the synthesis of pharmaceuticals, agrochemicals, dyes, pigments, and other organic compounds. It has a relatively high sorption coefficient, low water solubility, and extremely low H values. Therefore, it tends to sorb to the soil matrix and is not expected to volatilize into the atmosphere. It has high K_{ow}, indicating it might bioaccumulate.

Polycyclic Aromatic Hydrocarbons

PAHs are a group of chemicals that are formed during the incomplete burning of coal, oil and gas, garbage, and other organic substances. Particulate emissions to ambient air can result from adsorption onto soot particles that can be carried on wind currents and then returned to the surface (dry deposition). High-molecular-weight PAHs are more likely to be transported via particulate emissions, while low-molecular-weight PAHs have a greater tendency to volatilize (ATSDR, 1995). Fifteen PAHs are identified as exceeding screening criteria in soil at SWMU 6, including low- and high-molecular-weight compounds.

Solubility, volatility, biodegradability, and toxicity vary widely across this class of compounds (ATSDR, 1995). Most of the PAHs at SWMU 6 are essentially immobile in soil with very high distribution coefficients and very low water solubilities. Acenaphthylene, naphthalene, and phenanthrene are slightly more mobile PAHs but still have a low mobility

in soil. These PAHs are most likely to sorb tightly to soil or other organic matter. They are not likely to volatize. A primary fate and transport mechanism is migration of adsorbed PAHs with surface soil and sediment.

Photolysis and biodegradation are two common attenuation mechanisms for PAH compounds (Howard, 1991). Although all PAHs transform in the presence of light via photolysis, their rates are highly variable. Photolysis may reduce concentrations of these chemicals in surface waters or surface soils but is not relevant for subsurface soils. Biodegradation of PAHs in soils is also extremely variable across the chemical class. Generally, the PAHs with three or fewer rings biodegrade more readily than the higher-molecular-weight PAHs. Factors that affect the rate of biodegradation in soil include the types of microorganisms present, the availability of nutrients, the presence of oxygen, and the chemical concentration. The extent to which chemicals may biodegrade also can be affected by their presence in mixtures. If both stable and mobile PAHs are present in a mixture, the less readily degradable materials may be co-metabolized at a rate similar to or higher than those of the more readily degradable compounds (Howard, 1991).

Animals and microorganisms can metabolize PAHs to products that ultimately reach complete degradation. PAHs in soil may be assimilated by plants, degraded by soil micro-organisms, or accumulated to relatively high levels in the soils. High PAH concentrations in soil can lead to increased populations of soil microorganisms that are capable of degrading the compounds. PAHs can be taken into the mammalian body by inhalation, skin contact, or ingestion but are poorly absorbed from the gastrointestinal tract. Specific enzymes present in mammals metabolize PAHs, thus making the PAHs water-soluble and available for excretion. Although metabolic pathways detoxify PAHs, some metabolic intermediates may be toxic, mutagenic, or carcinogenic to the host.

5.4.2.3 Chlorinated Pesticides

Three chlorinated pesticides were identified as exceeding screening criteria in surface soil or sediment samples: DDD, DDE, and DDT. DDE and DDD enter the environment as a contaminant or breakdown product of DDT. None of these parameters were detected in subsurface soil or groundwater.

In general, these chlorinated pesticides have low H values and are not expected to volatilize quickly. However, they volatilize slowly from soil surfaces, depending on the temperature and humidity. These compounds have a low water solubility and very high K_{oc} values, indicating that these pesticides are more likely to sorb to soil and are not likely to leach to groundwater if organic matter is present. The most likely migration pathways for pesticides are transport in particulate emissions and transport of sorbed materials in surface runoff. Most DDT in soil biodegrades slowly to DDE and DDD. All three pesticides have a high K_{ow}, suggesting a high potential for bioaccumulation and biomagnification in the food web.

5.4.2.4 Polychlorinated Biphenyls (PCBs)

Two PCBs (Aroclor 1221 and Aroclor 1232) were identified as exceeding screening criteria in groundwater at SWMU 6. These PCBs were detected at low levels in well NDW06MW04 in September 2000. They were not detected during the September 2003 monitoring event.

Therefore, their presence in groundwater is questionable. This uncertainty will be addressed via additional groundwater sampling as part of the removal action confirmatory sampling protocol.

PCBs are persistent in the environment. In general, the persistence of the PCB congeners increases with an increase in the degree of chlorination. These PCBs are characterized by low water solubility, moderate volatility, high affinity for organic matter, and high resistance to chemical or biological degradation. They strongly sorb to soil and do not tend to leach to groundwater. In surface water, they partition to sediment and sorb to organic matter. PCBs bioaccumulate in aquatic organisms.

5.4.2.5 Perchlorate

Perchlorate was detected at SWMU 6 in one groundwater sample from well NDW06MW01 in September 2003. It was not detected in the same monitoring well during the May 2000 sampling event or during resampling in February 2004. The analytical methods for perchlorate are prone to result in false positives. Therefore, the presence of this compound in groundwater is questionable. This uncertainty will be addressed via additional groundwater sampling as part of the removal action confirmatory sampling protocol.

Perchlorate is a compound that has historically been used as an oxidant in missile and rocket propulsion systems (Urbansky, 2002). Perchlorate often occurs in the environment as an anion or salt and tends to be persistent. It can be reduced by metals and bacteria; however, reduction by metals is very slow unless perchlorate is in the form of a concentrated acid. Perchlorate salts do not sorb well to soil since both perchlorate ions and soil particles are negatively charged (ITRC, 2002). Any perchlorate adsorption is usually based on simple electrostatic bonds, or Vanderwalls forces, and is dependent on pH, soil mineralogy, organic content, ionic strength, and competing ions. Perchlorate in groundwater is very mobile. The perchlorate salts have varying water solubilities but are generally quite soluble (Urbansky, 2002).

5.4.2.6 Metals

Metals have been detected in all media at SWMU 6. In surface soil, antimony, arsenic, copper, iron, lead, thallium, and zinc exceeded their respective background levels and residential PRGs. In subsurface soil, only antimony and total chromium are identified as exceeding screening criteria. However, total chromium was reported below the background concentration in all samples. In sediment, all inorganic chemicals exceeding screening criteria were detected above the background levels.

In the water phase, the total metal concentration includes the dissolved metal concentration and the suspended metal concentration, which is sorbed to colloidal particles. Therefore, elevated metals concentrations in groundwater may be due to the suspended load and not just to the dissolved concentrations. For all groundwater samples collected at SWMU 6, dissolved (filtered) and total (unfiltered) metals were analyzed.

In surface water, all inorganics exceeding screening criteria, except for mercury, were detected at concentrations consistent with background levels (less than one order of magnitude difference). Dissolved mercury and dissolved nickel were detected in filtered

samples. This indicates that most inorganics listed as exceeding screening criteria in surface water are sorbed to soil or organic matter particulates. For groundwater, dissolved chemicals were generally detected in a similar number of samples as total metals. Of the detected dissolved metals, arsenic, cadmium, chromium, and selenium were detected at concentrations above the site-specific or basewide background levels.

Fate and Transport of Metals

The release and migration of metals in the subsurface environment is a complicated process. Because metals are typically not volatile, emissions to ambient air are usually in the form of particulate emissions. The mobility of metals depends on factors such as the overall groundwater composition, pH, metal complex formation, valence state of the metal, and cation-ion exchange capacity. Changes in the ORP in soil or groundwater can affect the chemical species that is present. Metals can occur in the environment as a free ion or as a complexed species, which is composed of positively charged cation and negatively charge anion or neutral molecule. Complexing generally increases the solubility and mobility of metals in groundwater. The type of complex a metal forms depends on whether the species is hard (strongly held electron field) or soft (deformable electron field). Hard species form stronger bonds than soft species.

The distribution between soil and water for metals is much more difficult to estimate than for organic compounds. Since the sorption of metals depends on pH, the metal concentration, the species present, and the type of complex formation, a single distribution coefficient or isotherm equation cannot be used to predict metal adsorption. Literature values for K_d can vary by more than two orders of magnitude (ERG, 2003). Generally, metal adsorption increases with pH. Inorganics most often sorb to clay minerals, organic matter, and iron and manganese oxyhydroxides. The surface charge of organic matter and oxyhydroxides is strongly pH-dependent, becoming more negative as pH increases and more positive as pH decreases. Metals may be sorbed on the surface of the soil or fixed to the interior of the soil, where they are unavailable for release to water. After available sorption sites are filled, most metals are incorporated into the structures of major mineral precipitates, as coprecipitates. At very high concentrations, they may be precipitated into pure metal phases.

The solubility of metals is also dependent on several factors. The solubility of cations decreases as pH increases. For a few cations (Be^{+2}, Zn^{+2}, Al^{+3}, and Fe^{+2}), metal solubility increases again at alkaline pH values. The solubility of metals may decrease depending on the complex formation. Some cations may complex with oxygen and hydroxide, forming insoluble oxyhydroxides, or may complex with phosphate, sulfate, and carbonate to form insoluble mineral precipitates. Metal sulfide complexes, which form in reducing environments, are extremely insoluble, and their formation tends to reduce the total metals concentrations. Metals may be removed from the water phase through mechanisms such as precipitation and irreversible sorption (EPA, 1979).

Metal concentrations are usually reported as total metal concentrations. However, metal toxicity is a function of the concentrations of specific metal species, not the total concentration. In the water phase, the total metal concentration includes the dissolved metal concentration and the suspended metal concentration, which is sorbed to colloidal particles.

As a result, the groundwater data may reflect metals concentrations that are associated with a significant percentage of colloidal material. Although the groundwater samples at SWMU 6 were filtered with a 0.45-micron filter, studies indicate that the most mobile particles are in the range of 0.1 to 0.55 micron and contribute as much as 40 percent of the total mobile metals (EPA, 1979). Therefore, elevated metals concentrations in groundwater may be due to the suspended load and not just to the dissolved aqueous chemistry.

The total concentration of metals in soils is generally not a reliable guide to the extent of total metal uptake by plants. The free metals ion activity in the soil solution has been shown to be a better indicator of bioavailability and toxic response than the total soil metal content (ERG, 2003). It is assumed that for a metal to be taken up by a plant or to exert an effect on plant growth, it must be present in solution. Therefore, factors that influence the speciation and solubility of heavy metals in soils also affect bioconcentration. The pH of soils can also impact the amount of plant uptake of certain elements.

The fate and transport properties of various metals are discussed in more detail below.

Arsenic, Antimony, Chromium, and Selenium

Arsenic, antimony, chromium, and selenium are inorganic chemicals that occur in the earth's crust and are released to soil and groundwater from natural and anthropogenic sources. These metals can be transported from soil by wind erosion or runoff, or they may leach into the subsurface. Selenium can volatilize from soil under certain oxidation states.

In oxidizing environments, these compounds primarily exist as oxyanions (hard anions that contain oxygen) and are relatively mobile. However, they can be adsorbed by clays, iron oxyhydroxides, aluminum hydroxides, manganese compounds, and organic material at acidic and neutral pHs. Arsenic and chromium can be reduced from higher to lower valance states by organic matter, divalent metals, and dissolved sulfide. In water, charged selenium reacts with metal cations to form insoluble metal selenides. Under reducing conditions, insoluble arsenic and antimony sulfides are precipitated.

Arsenic, chromium, and selenium bioaccumulate in aquatic organisms and may possibly pass through the food web. However, biomagnification of arsenic and chromium in aquatic food webs has not been documented. Antimony does not appear to bioconcentrate significantly in plants or aquatic organisms.

Barium

Barium occurs in the environment as a result of the weathering of rocks and minerals. It is a hard cation and is least soluble when combined with hydroxide, sulfate, carbonate, and phosphate species. Barium is most often found in inorganic complexes and is likely to precipitate out of solution as an insoluble salt. The maximum concentration of barium in groundwater is often limited by the solubility of the mineral barite (ERG, 2003). Barium may bioaccumulate in some plants and aquatic organisms.

Lead

Lead is present in the earth's crust and may be released from weathering processes and from anthropogenic sources. This element is a borderline hard/soft cation that forms insoluble metal sulfides in anaerobic environments. Lead generally exhibits little mobility in

groundwater systems and tends to sorb and be transported in water primarily with suspended colloidal particles (ERG, 2003). The concentration of lead in groundwater is usually controlled by the adsorption or coprecipitation with iron, manganese, and aluminum. Lead is relatively immobile in all matrices due to its strong tendency to be sorbed by iron and manganese oxides and the insolubility of many lead minerals. Lead is effectively removed from water by adsorption to organic matter and clay minerals, precipitation as insoluble salt, and the reaction with hydrous iron and manganese oxide. Lead bioaccumulates in plants and animals but may not biomagnify in the food chain.

Silver

Silver is a rare element that occurs in its pure form as a white, ductile metal and in ores. It has an average abundance of about 0.1 part per million (ppm) in the earth's crust and about 0.3 ppm in soils. Silver occurs primarily as sulfides, in association with iron (pyrite), lead (galena), tellurides, and gold. Silver is found in surface waters in various forms: (1) as the monovalent ion (e.g., sulfide, bicarbonate, or sulfate salts); (2) as part of more complex ions with chlorides and sulfates; and (3) adsorbed onto particulate matter. The transport and partitioning of silver in surface waters and soils are influenced by the particular form of the compound. Under oxidizing conditions, the primary silver compounds are bromides, chlorides, and iodides, while under reducing conditions the free metal and silver sulfide predominate.

The mobility of silver in soils is affected by drainage, ORP, pH, the reactivity of iron and manganese complexes (which tend to immobilize silver), and the presence of organic matter (which complexes with silver and reduces its mobility). Silver accumulation in marine algae appears to result from adsorption rather than uptake. Silver bioaccumulates to some degree in plants and animals.

Cadmium

Cadmium is present in the earth’s crust and may be released from weathering processes and from anthropogenic sources. This element is a borderline hard/soft cation which forms insoluble metal sulfides in anaerobic environments. The concentration of cadmium in groundwater is controlled by its adsorption or coprecipitation with iron, manganese, and aluminum. It is usually transported in water sorbed to suspended colloidal particles (ERG, 2003). Cadmium carbonates are relatively soluble at pH below 8. Cadmium is taken up by plants and may bioaccumulate in the animals that eat those plants.

Iron and Manganese

Iron and manganese are common elements in the environment. Manganese is a hard cation that is often precipitated in soils to manganese minerals. Iron is a hard cation in the Fe^{+3} oxidation state and a borderline cation in the Fe^{+2} oxidation state. The transport of these elements is dependent on their species and the pH and ORP of the soil or water environment. Both iron oxyhydroxides and manganese oxides are relatively insoluble in oxidizing environments and are strong sorbants of other metals. These oxyhydroxides and oxides can be used by microorganisms as electron acceptors under reducing conditions and are reduced to more soluble forms in a process known as bioreduction or reductive dissolution.

Manganese is a component of most foods and may be significantly bioconcentrated at lower trophic levels in water. Iron bioaccumulates in organisms, but its bioavailability is dependent on its species.

Thallium

Thallium is primarily released to the atmosphere from anthropogenic processes, such as the burning of coal and smelting. The mobility of thallium in water is limited by the low solubility of thallium oxides, and it is soluble only in highly reducing environments, in the charged ionic form. Thallium is strongly adsorbed by montmorillonite clays and manganese oxides. Thallium bioaccumulates in plants and animals.

5.5 Contaminant Migration

Fifteen surface soil samples were collected during the RI in addition to the eight surface soil samples collected during the Expanded PA/SI. Four subsurface soil samples were also collected during the PA/SI. These soil samples were collected at locations within the waste disposal area, around its perimeter, and downgradient to characterize the source area and surrounding area. However, soil samples were not collected directly through the waste piles due to safety concerns. Twelve metals, one VOC, twelve SVOCs, and three pesticide compounds were detected in surface soil samples above screening criteria. Most of the metals are at concentrations consistent with background levels.

No high-concentration source areas (i.e., one that would be considered a principal threat waste) were identified, but it is recognized that soil samples were not collected through the waste piles, which may have resulted in an underestimation of contaminant levels in soil. A few metals, such as arsenic, cadmium, lead, thallium, and zinc, were detected in the general waste disposal area at concentrations above background and at least one of the screening criteria. SVOCs exceeding screening criteria were detected in 5 of 23 surface soil samples. Pesticide compounds (either DDT, DDE, or DDD) were detected above ecological screening criteria in 9 of 23 surface soil samples.

5.5.1 Surface Soil to Surface Water Pathway

One of the potential migration pathways for SWMU 6 is transport of site soil by stormwater or surface water runoff (i.e., during exceptionally high tides) to downstream locations. Evaluation of the surface water data indicated that several metals, such as arsenic, copper, lead, nickel, mercury, and silver, were detected in the unfiltered samples above ecological screening criteria in at least one sample (see Figure 4-7). However, the filtered surface water samples indicated much lower concentrations of metals, and only nickel was detected in the filtered samples above screening criteria. This indicates that much of the metal was bound to particulates in the surface water. No organic chemicals were detected in surface water samples above screening criteria. Overall, no obvious patterns of screening criteria exceedances in surface water were observed to indicate that chemicals are migrating from surface soil at SWMU 6 to surface water at significant concentrations. However, as noted above, the planned removal action will eliminate the waste and associated contaminated soil in order to address this potential contaminant migration pathway.

5.5.2 Surface Soil to Sediment Pathway

Migration of surface soil to sediment is feasible due to stormwater runoff during storm events or exceptionally high tides that result in surface flooding of SWMU 6. Evaluation of sediment data indicated that several metals were detected in sediment samples above ecological screening criteria (see Figure 4-8). Most of the exceedances occurred in sediment samples collected near the metal bridge on Highway 200 near the site. The sample collected at station NDW06SD02 in 2000 exhibited the highest metals concentrations. Resampling of this location in 2003 indicated lower metals concentrations at this location than were detected in 2000.

Copper was the most widely detected metal in sediment above its screening criteria. The greatest copper concentrations were detected near the metal bridge that crosses Highway 200 near the site. No other obvious patterns of copper concentrations in sediment samples were identified. Runoff from the site could have contributed to the copper detected in sediment near the site. Copper concentrations in several surface soil samples exceeded background and screening criteria. Average copper concentrations in surface soil at SWMU 6 were below background. The surface soil background value for copper (68 mg/kg) exceeds most of the copper detections in sediment, indicating that background conditions may contribute significantly to the copper detections in sediments.

DDT, DDE, and/or DDD were detected in 4 of 19 sediment samples above ecological screening criteria. In addition, bis(2-ethylhexyl)phthalate, a common laboratory contaminant, was reported above ecological screening criteria in 2 of 19 sediment samples. Most of these exceedances occurred in samples collected near the metal bridge on Highway 200 near the site. Runoff from the site could have contributed to these detections. However, as noted above, the planned removal action will eliminate the waste and associated contaminated soil in order to address this potential contaminant migration pathway.

5.5.3 Surface Soil to Subsurface Soil Pathway

Leaching of chemicals from surface soil to subsurface is a potentially viable migration pathway at SWMU 6. Only antimony was detected, in a single subsurface soil sample, above both its leachability screening value and its background concentration. The surface soil sample at this location also indicated antimony exceeded its leachability screening value. Overall, mean antimony concentrations in surface soil were below background. A groundwater sample collected from a well at the location of the antimony exceedance indicated total antimony (in the unfiltered sample) to be elevated. However, the filtered groundwater samples from this location did not have detectable concentrations of antimony, indicating that its detection in the unfiltered sample was likely due to suspended particulates. No other inorganic or organic chemicals exceeded their leachability screening value and background value in subsurface soil at the site, indicating that downward migration of chemicals to groundwater at concentrations that may pose a risk above that of background may not be a significant concern at a site with a relatively thick unsaturated zone. It is recognized, however, that groundwater occurs at very shallow depths at this site, so downward migration of chemicals (via leaching to groundwater) may be a significant migration pathway, as discussed below.

5.5.4 Surface to Groundwater Pathway

Leaching of chemicals from surface soil to groundwater is a potentially viable migration pathway particularly since the groundwater occurs within 2 feet of the surface. Both filtered and unfiltered groundwater samples were analyzed during the 2003 sampling event. The unfiltered samples generally showed the presence of more metals above screening criteria than did the filtered metals, indicating that some of the detections in the unfiltered samples are likely related to the presence of particulates in the samples.

In the filtered samples, several metals that exceed the screening criteria, such as iron, manganese, antimony, selenium, and arsenic, are known to be sensitive to ORP conditions and the presence of these metals in filtered samples is typically due to geochemical processes such as dissimilatory iron reduction.

Elevated concentrations of manganese in the filtered samples during both the 2000 and 2003 sampling events suggest that manganese reduction may be a predominant electron-accepting process in the shallow aquifer. In this process, soil bacteria use available soil organic matter as an electron donor and manganese present in mineral form as an electron acceptor, causing increases in soluble manganese (+2 valence). Elevated concentrations of iron in the filtered samples during the 2003 sampling event suggest that iron reduction, a process similar to manganese reduction, was occurring during 2003. These processes often occur in aquifers with organic-rich soil and depleted oxygen under reducing (low ORP) conditions. Other metals that are sensitive to low ORP and may be elevated under these conditions include antimony, arsenic, and selenium. These three metals were elevated in at least one groundwater sample at the site, and these metals plus manganese comprised most of the exceedances of screening criteria in filtered groundwater samples. Their presence in dissolved form may be due to site-specific background geochemical conditions. Barium concentrations are elevated above site-background levels in some wells but are not above the basewide background groundwater concentration (960 µg/L), indicating that barium concentrations in groundwater may not be site-related.

PCBs (Aroclor 1221 and 1232) were detected in one groundwater sample (from well NDW06MW04) during the May 2000 event (Figure 4-6). This well was resampled in 2003, and PCBs were not detected.

Perchlorate was detected in one groundwater sample at well NDW06MW01 in September 2003 (Figure 4-6). It was not detected in this well when sampled previously in May 2000 or subsequently in February 2004. Perchlorate was not detected in any other site media. The analytical methods for perchlorate are prone to result in false positives. Therefore, the presence of perchlorate in groundwater is questionable. However, this uncertainty, as well as the soil (waste)-to-groundwater potential contaminant migration pathway, will be addressed by the planned removal action.

TABLE 5-1

Summary of Field Sampling Data for Groundwater, 2003
SWMU 6 Former NASD, Vieques Island, Puerto Rico

Well	DO, mg/L	ORP, mV	Specific Conductance, umhos/cm	Total Dissolved Solids, mg/L *	Turbidity, NTU
NDW06MW01	0	-300	90,635	53,475	3.4
NDW06MW02	3.2 - <0.5	-304	71,950	42,451	1.8
NDW06MW03	6.7 - 3.3	-319	65,760	38,798	1.2
NDW06MW04	8.8 - 0	-293	79,350	46,817	0.9
NDW06MW05	18.5 - 5.8	-272	60,770	35,854	3.7
NDW06MW06	0	-295	77,212	45,555	3.6
NDW06MW07	1.8 - 0	-261	74,236	43,799	2.0
NDW06MW08	0	-296	69,270	40,869	1.6

* TDS estimated equal to as specific conductance (umhos/cm) times 0.59, in mg/L. Hem, 1985. Study and Interpretation of the chemical charateristics of natural water (3rd Edition) U.S. geological Survey water Supply Paper 2254, 264 pp

TABLE 5-2

Fate and Transport Parameters for selected COPCs
SWMU 6 Mangrove Disposal Site
SWMU 6 Former NASD, Vieques Island, Puerto Rico

Compound	Chemical Group	Organic Carbon Partition Coefficient/ Koc (L/kg)		Soil Distribution Coefficient/ Kd (L/kg)		Water Solubility (mg/L)		Henry's Law Constant/H (atm*m3/Mol)		Octanol Water Partition Coefficient/ Kow (L/kg)	
ALUMINUM	Inorganic			NL							
ANTIMONY	Inorganic			4.50E+01	a						
ARSENIC	Inorganic			2.90E+01	a						
BARIUM	Inorganic			4.10E+01	a						
CADMIUM	Inorganic			7.50E+01	a						
CHROMIUM, TOTAL	Inorganic			1.90E+01	a						
COPPER	Inorganic			5.01E+02	c						
IRON	Inorganic			NL							
LEAD	Inorganic			1.58E+04	c						
MANGANESE	Inorganic			NL							
MERCURY	Inorganic			5.20E+01	a			1.14E-02	a		
NICKEL	Inorganic			6.50E+01	a						
SELENIUM	Inorganic			5.00E+00	a						
SILVER	Inorganic			8.30E+00	a						
THALLIUM	Inorganic			7.10E+01	a						
VANADIUM	Inorganic			1.00E+03	a						
ZINC	Inorganic			6.20E+01	a						
p,p'-DDD	Pesticide	1.00E+06	a			9.00E-02	a	4.00E-06	a	1.05E+06	b
p,p'-DDE	Pesticide	4.47E+06	a			1.20E-01	a	2.10E-05	a	3.24E+06	b
p,p'-DDT	Pesticide	2.63E+06	a			2.50E-02	a	8.10E-06	a	1.05E+06	b
PCB-1221 (AROCHLOR 1221)	PCB	3.09E+05	a			5.90E-01	b	3.50E-03	b	5.01E+04	b
PCB-1232 (AROCHLOR 1232)	PCB	3.09E+05	a			4.50E-01	b	NL		1.26E+05	b
ACENAPHTHYLENE	SVOC	7.08E+03	a			4.24E+00	a	1.55E-04	a	9.55E+03	b
bis(2-ETHYLHEXYL) PHTHALATE	SVOC	1.51E+07	a			3.40E-01	a	1.02E-07	a	1.58E+04	e
BENZO(a)ANTHRACENE	SVOC	3.98E+05	a			9.40E-03	a	3.34E-06	a	4.07E+05	b
BENZO(a)PYRENE	SVOC	1.02E+06	a			1.62E-03	a	1.13E-06	a	1.15E+06	b
BENZO(b)FLUORANTHENE	SVOC	1.23E+06	a			1.50E-03	a	1.11E-04	a	1.10E+06	b
BENZO(g,h,i)PERYLENE	SVOC	1.58E+06	b			2.60E-04	b	1.44E-07	b	3.16E+06	b
DIBENZ(a,h)ANTHRACENE	SVOC	3.80E+06	a			2.49E-03	a	1.47E-08	a	6.92E+06	b
FLUORANTHENE	SVOC	1.07E+05	a			2.06E-01	a	1.61E-05	a	7.94E+04	b
INDENO(1,2,3-c,d)PYRENE	SVOC	3.47E+06	a			2.20E-05	a	1.60E-06	a	1.51E+04	b

TABLE 5-2

Fate and Transport Parameters for selected COPCs
SWMU 6 Mangrove Disposal Site
SWMU 6 Former NASD, Vieques Island, Puerto Rico

Compound	Chemical Group	Organic Carbon Partition Coefficient/ Koc (L/kg)		Soil Distribution Coefficient/ Kd (L/kg)	Water Solubility (mg/L)		Henry's Law Constant/H (atm*m3/Mol)		Octanol Water Partition Coefficient/ Kow (L/kg)	
NAPHTHALENE	SVOC	2.00E+03	a		3.10E+01	a	4.83E-04	a	1.95E+03	b
PHENANTHRENE	SVOC	1.41E+04	b		1.20E+00	b	2.56E-05	b	2.82E+04	b
PYRENE	SVOC	1.05E+05	a		1.35E-01	a	1.10E-05	a	3.80E+06	b
CHLOROFORM	VOC	3.98E+01	a		7.92E+03	a	3.66E-03	a	9.33E+01	b
PERCHLORATE	Perchlorate	Low	f		2.00E+05	f	Nonvolatile	f	1.45E-06	f

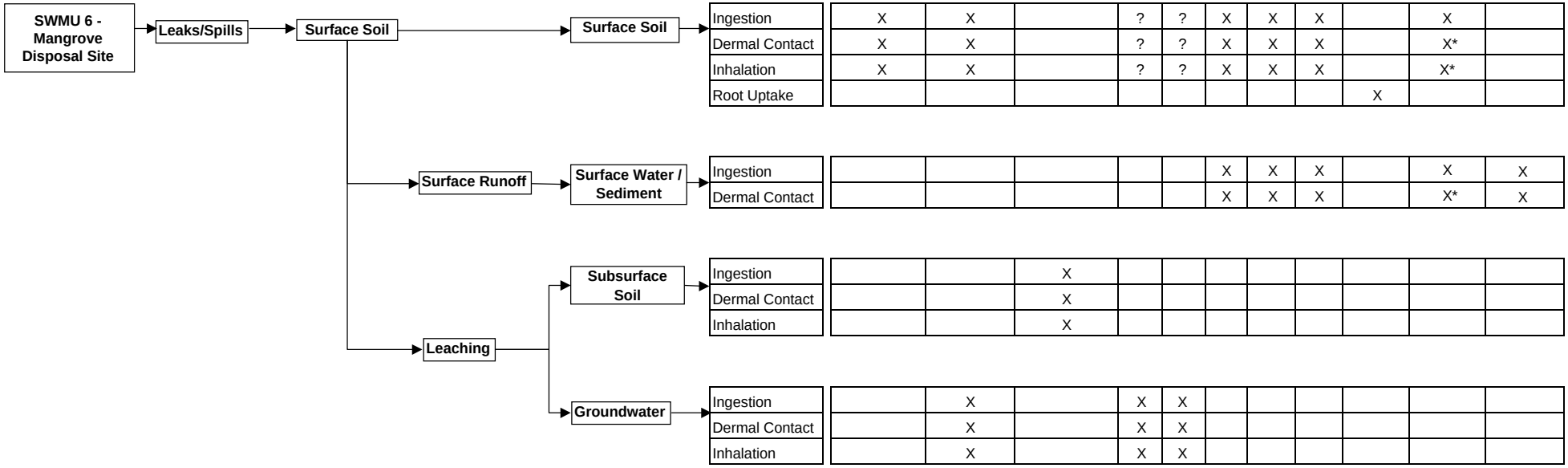
Notes:

1. The soil distribution parameter for metals assumes a typical soil pH of 6.8.
2. Transport properties for inorganics are high variable dependent the chemical species and the site-specific environment. Therefore, the solubility, H, and Kow were not listed for metals.

Sources:

a. EPA July 1996. *Soil Screening Guidance: User's Guide, Attachment C.* Office of Solid Waste and Emergency Response, EPA, Washington, DC.
b. ASTDR. Toxicological Profiles: http://www.atsdr.cdc.gov/toxpro2.html#Final
c. HydroGeoLogic, Inc. June 1999. *Draft Partition Coefficients for Metals in Surface Water, Soil, and Waste.* Prepared for EPA.
d. Spectrum Laboratory. Chemical Fact Sheets: http://www.speclab.com/compound
e. Mackay, D., W. Shiu, and K. Ma. 2000. Physical-Chemical Properties and Environmental Fate Handbook. Chapman&Hall/CRCnetBase
f. Interstate Technology and Regulatory Council. August 2002. *A Systematic Approach to In Situ Bioremediation in Groundwater Including Decision Trees on In Situ Bioremediation for Nitrates, Carbon Tetrachloride, and Perchlorate.* In Situ Bioremediation Team.

L/kg = liters per kilogram
mg/L = milligrams per liter
atm*m3/Mol = atmosphere times cubic meters per mole



Primary Source	Primary Release Mechanism	Secondary Source	Secondary Release Mechanism	Exposure Media	Exposure Route	Potential Human Receptors								Potential Ecological Receptors		
						Maintenance Worker	Industrial Worker	Construction Worker	Residential		Recreational			Terrestial		Aquatic
									Adult	Child	Adult	Child	Youth	Plants	Animals	
SWMU 6 - Mangrove Disposal Site	Leaks/Spills	Surface Soil		Surface Soil	Ingestion	X	X		?	?	X	X	X		X	
					Dermal Contact	X	X		?	?	X	X	X		X*	
					Inhalation	X	X		?	?	X	X	X		X*	
					Root Uptake									X		
			Surface Runoff	Surface Water / Sediment	Ingestion						X	X	X		X	X
					Dermal Contact						X	X	X		X*	X
			Leaching	Subsurface Soil	Ingestion			X								
					Dermal Contact			X								
					Inhalation			X								
				Groundwater	Ingestion		X		X	X						
					Dermal Contact		X		X	X						
					Inhalation		X		X	X						

Legend

X - Potentially complete exposure pathways identified

? = Questionabe pathway; however included in the risk assessment for comparison purpose.

* = Receptor not evaluated quantitatively in Section 6

Figure 5-1
Conceptual Site Model for SWMU 6: Former Mangrove Disposal Site
SWMU 6, Former NASD, Vieques, Puerto Rico

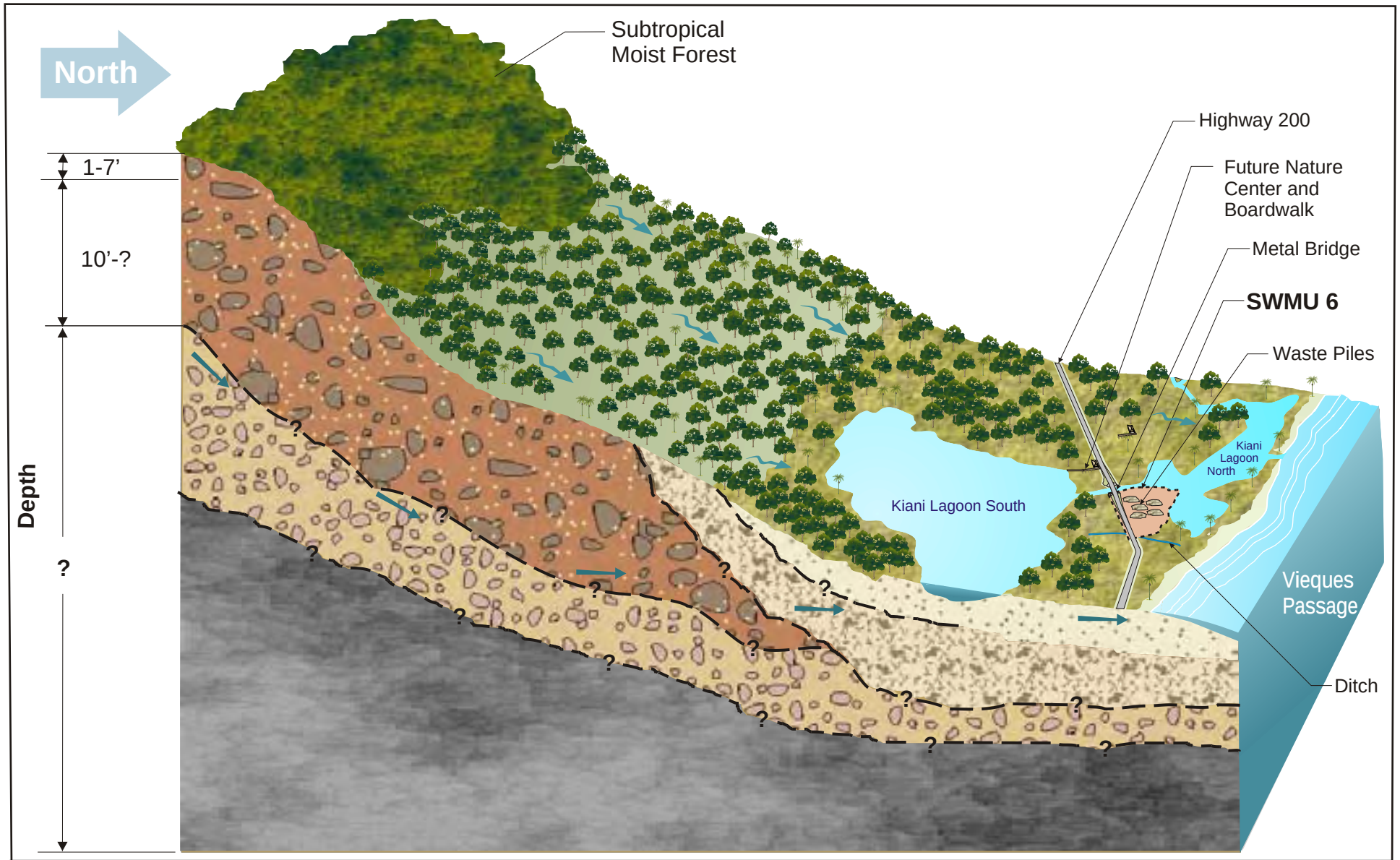


FIGURE 5-2
Conceptual Site Model
SWMU 6, *Former NASD, Vieques Island, Puerto Rico*

CH2MHILL

ES022007003TPA

SECTION 6

Remedial Investigation Conclusions and Recommendations

6.1 Summary and Conclusions

SWMU 6 is a former solid waste disposal site on the former NASD in the western portion of Vieques Island, Puerto Rico. In April 2004, the Draft RI Report for SWMU 6 was submitted for regulatory agency review. Soil samples were collected primarily adjacent to waste piles rather than directly through the waste piles (due to safety concerns), and the conclusions drawn based on those data were that the site does not pose an unacceptable risk to human health or the environment. While uncertainty is inherent (and at some level, acceptable) in all findings, conclusions, and decisions made in the environmental investigation and remediation process, the Navy and regulatory agencies have concurred that the uncertainty associated with the waste representing a potential future source of contamination (and associated potential risks) is unacceptable.

In 2005, the Navy, USEPA, and the PREQB concurred that a waste removal action, coupled with a robust waste characterization and confirmatory sampling protocol, will address the uncertainties associated with the findings and conclusions of the RI Report and ensure residual media concentrations are protective of human health and the environment. Prior to the removal action, soil samples will be collected across the disposal area (including within the waste piles) to determine the appropriate disposal alternative(s).

Following the removal action, confirmatory samples will be collected from the excavated area and a risk assessment will be performed to ensure residual media concentrations are protective of human health and the environment. The risk assessment will take into consideration the information presented in the Comprehensive Conservation Plan provided by the DOI. Additionally, the risk assessment will be performed in accordance with the human health and ecological risk assessment protocols in the Master Quality Assurance Project Plan (CH2M HILL, May 2006), refined as applicable in accordance with regulatory agency comments.

The site is located in the area of the land currently transferred to the DOI. SWMU 6, the Mangrove Disposal Site, was used by the former NASD for disposing of solid and generic waste during the 1960s and 1970s. SWMU 6 is a relatively flat mangrove swamp approximately 100 feet south of Vieques Passage. The site is just over one acre in area and is bounded on the west by a canal that connects Kiani Lagoon North and Kiani Lagoon South. Highway 200 runs east-west through the southern end of the site. A small water-filled ditch runs adjacent to the eastern boundary of the site. The waste at the site extends approximately 100 to 120 feet north-northeast of Highway 200. Waste disposed at the site includes former containers of lubricants, oil, solvents, and paints, broken glass, and rubble. No UXO/OE items have been identified at SWMU 6. However, munitions-related items

with no explosive hazard have been identified, such as inert concrete filled practice bombs, empty bomb dispensers, and empty shell casings, again in much deteriorated condition.

A geophysical survey was conducted at SWMU 6 to delineate the extent of the buried waste, as described in Section 3. Most ferrous metal debris is present in the northern portion of the site and under the road of the surveyed area.

The lithology at SWMU 6 consists of silty sand with organic material, which is underlain by well-graded sand with crushed shells. The maximum depth of the investigation was 15 feet bls.

Kiani Lagoon North, Kiani Lagoon South, and the canal are adjacent to the site and directly connected to Vieques Passage. Water from the lagoons rises and falls with the tides, at times covering portions of the site with water. Based on the June 2003 hydraulic tidal study, the North Lagoon and South Lagoon stilling wells showed tidal fluctuations of approximately 0.7 feet and indicated a flow reversal to the north or south depending on the stage height of the tide.

Groundwater at SWMU 6 exists under unconfined conditions within the Resolución Valley aquifer. The depth to groundwater is approximately 1 to 2 feet bls.

Groundwater in the SWMU 6 area flows in a generally northerly direction, toward Vieques Passage. However, within the site, local groundwater flow is dependent on tidal fluctuations. Based on the June 2003 hydraulic tidal study, groundwater at the site was observed to vary approximately 0.4 feet during tidal changes. During high tides, local groundwater flows to the southwest toward Kiani Lagoon South. During low tides, local groundwater flows to the northwest toward Kiani Lagoon North. The groundwater at the site has high salinity from the observed high TDS readings, indicating water quality that is similar to sea water.

6.1.1 Remedial Investigations Activities

To meet the RI objectives, a number of tasks were completed that include the following:

- Geophysical surveys were performed to delineate the extent of the solid waste disposed of at the site and to confirm that no MEC are present at proposed sampling locations. The results of the geophysical investigation stated that the specific conductance and in-phase data at SWMU 6 are dominated by the near-surface, saline water table. The presence of subsurface debris was correlated with the presence of surface debris.
- A total of 23 surface soil and 8 subsurface soil borings were sampled to: (1) characterize the site geology and (2) provide samples for laboratory analysis.
- Four monitoring wells were installed to supplement data from the four monitoring wells installed during the Expanded PA/SI to characterize the groundwater flow conditions and provide groundwater samples for analyses. Two monitoring wells (NDW06GW07 and NDW06GW08) were installed upgradient of the site as site-specific background wells.
- Groundwater elevation data were collected and groundwater flow conditions were assessed from eight site wells, and groundwater samples also were collected to assess water quality.

- Fourteen surface water surface water and nineteen sediment samples were collected to characterize environmental conditions in surface water bodies around SWMU 6. Five sediment and surface water sample locations NDW06SD/SW02, NDW06SD/SW03, NDW06SD/SW05, NDW06SD/SW06, and NDW06SD/SW07 were resampled at previously sampled locations; the station identification numbers were the same for the 2000 and 2003 sampling efforts.
- All the data for soil, groundwater, sediment, and surface water were submitted for laboratory analysis for full suite of analytical groups including metals, VOCs, SVOCs, pesticides, PCBs, perchlorate, and explosives.
- Validation of all analytical data was conducted by a third-party reviewer. The DQE of the validated data was also conducted following EPA functional guidelines. The DQE results are discussed in Section 4.

The RI was completed in accordance with the provisions of CERCLA and followed the EPA interim final *Guidance for Conducting Remedial Investigations and Feasibility Studies under CERCLA* (EPA, 1988). The analytical data were compared to EPA Region 9 PRGs and ecological screening criteria to assess whether a detailed risk assessment is required.

6.1.2 Nature and Extent Determination

The discussion below is a summary of the nature and extent of contamination, based on the sample distribution from the Expanded PA/SI and RI. It should be noted that the representation of the nature and extent does not include data from directly through the waste piles, so it is possible that higher levels of constituents would have been detected within or directly beneath the waste piles. However, this is an uncertainty that will be addressed via the removal action and its associated waste characterization and confirmatory sampling protocol and residual risk assessment.

6.1.2.1 Soil

The following conclusions were derived from the analytical results of the soil samples:

- Seven of the metals detected were above background and a screening criteria (antimony, arsenic, copper, iron, lead, thallium, and zinc). The elevated metals concentrations were detected at 10 surface soil sample locations out of 23 soil samples.
- The organochlorine pesticide DDT and its degradation products DDD and DDE were detected above ecological screening criteria.
- One PCB (Aroclor-1254) was detected in one surface soil sample collected at SWMU 6. It was not detected above its residential PRG or ecological criteria.
- Five of the detected SVOCs were above their respective residential PRGs. Seven of the detected SVOCs were above their respective ecological screening criteria. Benzo(a)anthracene and carbazole were the only SVOCs detected above their SSLs.
- None of the surface soil samples contained detectable levels of VOCs, perchlorates, or explosives above PRGs.

- The analytical results of the subsurface soil samples show that only antimony exceeded its background level and leachability screening criteria.
- None of the detected VOCs, SVOCs, and pesticides detected in the subsurface soil samples were above their leachability screening criteria.

The chemicals exceeding the PRGs were evaluated in the human health and ecological risk assessments.

6.1.2.2 Groundwater

The following conclusions were derived from the analytical results of the groundwater samples:

- Nine metals (antimony, arsenic, cadmium, chromium, iron, lead, selenium, silver, and thallium) were detected above screening criteria and background levels in unfiltered samples. Six metals were also detected in filtered samples above the PRGs; these were arsenic, cadmium, chromium, iron, lead, and selenium.
- Two PCBs, Aroclor-1221 and Aroclor-1232, were detected above screening criteria in the groundwater samples collected from SWMU 6. They were both detected in the same sample collected from NDW06MW04 in 2000. PCBs were not detected in the same well during the 2003 sampling effort.
- No SVOCs or pesticides were detected in site groundwater.
- Chloroform was detected in two groundwater samples; one low level detection at 1.1 µg/L, exceeded its PRG.
- Perchlorate was detected at 12.8 J µg/L in one groundwater sample collected from SWMU 6. This well was resampled in February 2004 for perchlorate, and it was not detectable. Explosives were not detected in any of the groundwater samples collected from SWMU 6.

The chemicals exceeding the PRGs were evaluated in the human health and ecological risk assessments.

6.1.2.3 Surface Water

The following conclusions were derived from the analytical results of the surface water samples:

- Five inorganic chemicals (arsenic, copper, lead, mercury, and silver) exceeded their respective ecological screening criteria in the unfiltered samples. Nickel was detected above its screening criteria in filtered samples. The background surface water sample did not have these metals at detectable levels.
- VOCs, pesticides/PCBs, explosives, and perchlorates were not detected in any surface water samples collected at SWMU 6. Neither of the two phthalates detected were above criteria.

The chemicals exceeding the PRGs were evaluated in the human health and ecological risk assessments.

6.1.2.4 Sediment

The following conclusions were derived from the analytical results of the sediment samples:

- Antimony, arsenic, barium, cadmium, copper, lead, mercury, nickel, silver, and zinc exceeded their respective ecological screening criteria and the background levels (see Table 4-14) in at least one sample.
- Seven VOCs (acetone, carbon disulfide, ethylbenzene, methyl ethyl ketone, methylene chloride, toluene, and xylenes) were detected in sediment samples at SWMU 6. However, none of these exceeded the respective screening criteria.
- Ten SVOCs were detected in sediment samples collected at SWMU 6. Only bis(2ethylhexyl)phthalate was detected above its ecological screening criterion in two samples.
- The organochlorine pesticide DDT and its degradation products DDD and DDE were detected above screening criteria in sediment samples collected at SWMU 6.
- No other pesticides or PCBs were detected in SWMU 6 sediment samples.
- No explosives or perchlorates were detected in any sediment samples collected at SWMU 6.

The chemicals exceeding the PRGs were evaluated in the human health and ecological risk assessments.

6.1.3 Fate and Transport Evaluation

The discussion below is a summary of the fate and transport of constituents, primarily those identified as contaminants, based on the sample distribution from the Expanded PA/SI and RI. It is recognized that there is uncertainty associated with constituents identified as contaminants and their associated concentrations because soil samples were not collected directly through the waste piles. It is possible that additional contaminants or contaminants at higher concentrations would have been identified under those circumstances. However, the general discussion of fate and transport is appropriate based on the data collected. Further, the removal action will address the contamination present in the waste, which will address the uncertainty associated with contaminant types and levels and their associated fate and transport.

A fate and transport evaluation was performed for the potential contaminants at SWMU 6. The primary migration pathways for the transport of contaminants from the mangrove disposal area are the leaching of contaminants from surface and submerged or buried waste into soil and then to groundwater and through surface runoff into the canal (connecting to Kiani Lagoon North and Kiani Lagoon South) and a small water-filled ditch to the east. Based on possible migration pathways and chemical characteristics, it appears that a few chemicals may have been released at the site during disposal activities and transported to subsurface soil, groundwater, surface water, or sediment. Chloroform, Aroclor 1221, Aroclor 1232, and perchlorate have been occasionally and inconsistently detected in groundwater. The analytical method for perchlorate is prone to false positive detects (DoD, 2004). The source of these chemicals may not be site-related. Additionally, since bis(2-

ethylhexyl)phthalate is a common laboratory and field contaminant, its source in site media is questionable.

Metals are common at the site in all environmental media. Except for eight metals (arsenic, antimony, cadmium, copper, iron, lead, thallium, and zinc), all inorganic chemicals in surface and subsurface soils were below their respective background concentrations. Therefore, most inorganic chemicals at the site appear to be from background occurrence. The fate and transport of metals is difficult to predict. The persistence and mobility of metals is dependent on several factors, including ORP, pH, metal complex formation, valence state of the metal, the clay, organic matter, and iron and manganese oxides. Most metals detected in surface water are primarily sorbed to particulate and organic matter rather than in the dissolved phase. This makes the metals' bioavailability lower than when they are in the dissolved form.

It is possible that some of the observed metals in groundwater, such as manganese, iron, and other redox-sensitive metals, at the site could be due to geochemical processes occurring in the site subsurface environment. Changes from oxidizing to reducing conditions often correlate with an increase in the solubility and thus an increase in the concentration of several metals, such as iron and manganese. Anaerobic bacteria can use insoluble iron oxyhydroxides and manganese oxides as electron acceptors, consequently reducing them to soluble iron and manganese ions. Therefore, the presence of elevated metals in groundwater may also be due to environmental conditions in this wetland area rather than from a release of metals from waste disposal activities.

6.1.4 Human Health Risk Assessment

The discussion below is a summary of the human health risk assessment conducted for SWMU 6, based on the data from the sample distribution discussed previously. It should be noted that the assessment of risk does not account for potentially higher soil constituent concentrations within and beneath the waste piles, so there is uncertainty associated with the COPCs identified and the risk assessment conclusions drawn based on those COPCs. However, this is an uncertainty that will be addressed via the removal action and its associated waste characterization and confirmatory sampling protocol and residual risk assessment.

The site exposure media evaluated were surface soil, subsurface soil, sediment, surface water, and groundwater. All the detected chemicals in the Expanded PA/SI and the RI were included for COPC selection. The maximum detected chemical concentration was compared against the screening criteria presented in the RAGS Part D tables in Appendix L.

Detected chemicals were screened against criteria as described in Section 4 to determine the nature and extent of contamination. The only chemicals identified as COPCs were inorganic chemicals and PAHs in soils and historical detection of PCBs and inorganic chemicals in groundwater.

The DOI conducted a limited investigation of biota chemical concentrations by sampling two land crabs and one composite sample of fiddler crabs. The land crab tissue indicated the presence of three metals, and one of the two land crab samples had two organochlorine pesticides that are commonly found in the general area possibly due to past uses of these chemicals such as agricultural pest control uses or facility maintenance type of activities

during past Navy operations. The purpose of the sampling was to assess the potential impacts of the waste disposal to the area's ecological receptors; therefore, only total body chemical levels were measured during the DOI sampling from these crabs. Thus, it may not be appropriate to include these results for health impacts that could be from edible tissue consumption, whereas the DOI samples represent whole body concentrations. Additionally, documentation regarding the exact locations at which the crabs were collected and industry-standard QA/QC reports for the crab analyses have not been received, making data interpretation more difficult. As a conservative evaluation, a comparison was made to the calculated PRGs (see Appendix I). The metals did not exceed the calculated PRGs, and meal limitation would be indicated for the crabs due to the presence of pesticides. However, the site is not likely to support unlimited ingestion due to the small area with a limited occurrence of crabs within the site.

The risk assessment evaluated the exposure of potential receptor populations such as maintenance workers, industrial workers, construction workers, recreational receptors, and residential receptors. The risk assessment was conducted using conservative exposure assumptions for unrestricted land use. The estimated cancer risks from soils were within target limits for all the receptors. The HI for soils was above target limits for the residential child due to the presence of iron and vanadium in soils. The sediment HI was above target limits to a recreational child due to historical detection of thallium at a location near the bridge; thallium was not detected at such concentrations in the latest samples from same location (see Appendix L). Also, the risks and HI from groundwater exposure through potable use were above target limits due to the arsenic level. Both total and dissolved arsenic levels are elevated in four wells (NDW06MW01, NDW06MW02, NDW06MW05, and NDW06MW06). The presence of other major cations at similar elevated concentrations in these wells indicates that the dissolved metals' presence may be due to natural geochemical conditions at the site. Also, site soils did not have elevated arsenic. The high salinity of groundwater in this area would preclude its use as a drinking water supply; thus, no consumption of this groundwater is likely. Puerto Rico regulations require that groundwater with TDS less than 10,000 mg/L be considered potable. All of the groundwater samples collected at SWMU 6 had chloride concentrations greater than 27,000 mg/L.

The organic chemicals in site soils, groundwater, sediment, and surface water do not likely present significant risks or hazards, but it is recognized that this conclusion with respect to soil is uncertain because soil samples were collected adjacent to the waste piles, rather than directly within/beneath them. All the other chemicals are inorganic. Some of the metals in soils detected above background levels, such as iron, do not likely present significant risk when compared to the other metals at the site and may not be associated with the wastes at the site, but it is recognized that this conclusion with respect to soil is uncertain because soil samples were collected adjacent to the waste piles, rather than directly within/beneath them. Potential risks associated with groundwater are mostly due to arsenic in groundwater, which is saline. The HI is due to other inorganic chemicals, which are higher in total metal form. Manganese and iron are elevated in site wells and do not appear to be associated with the presence of wastes, based on their locations across the site as discussed in Appendix L. Therefore, due to the absence of site-specific risks above target limits, the site would not be proposed for further remedial action from a calculated risk standpoint. However, because of the uncertainty associated with the risk conclusions and the

uncertainty of the debris being a potential future source of contamination, the agencies have concurred that in order to address the uncertainty and ensure the residual media concentrations at the site are protective of human health, a removal action will be performed.

6.1.5 Ecological Risk Assessment Conclusions

The discussion below is a summary of the ecological risk assessment conducted for SWMU 6, based on the data from the sample distribution discussed previously. It should be noted that the assessment of risk does not account for potentially higher soil constituent concentrations within and beneath the waste piles, so there is uncertainty associated with the COPCs identified and the risk assessment conclusions drawn based on those COPCs. However, this is an uncertainty that will be addressed via the removal action and its associated waste characterization and confirmatory sampling protocol, including a residual risk assessment.

An ERA was conducted in accordance with the *Navy Policy for Conducting Ecological Risk Assessments* and the EPA Ecological Risk Assessment Guidance for Superfund (EPA, 1997).The potential for adverse effects associated with the PCOCs are evaluated in the ecological risk assessment section.

6.1.5.1 Surface Soil Exposures

Eight metals (aluminum, chromium, copper, iron, lead, manganese, vanadium, and zinc) were identified as PCOCs in surface soils from SWMU 6. Iron, copper, lead, and zinc exceeded background concentrations in some of the 23 site samples. The mean HQs for these metals were low.

The pesticides DDD, DDE, and DDT were identified as PCOCs. These chemicals exceeded soil screening values but were below the intervention value. The risk associated with direct exposure to these pesticides is likely to be low, as the detected concentrations did not exceed the intervention value.

Six PAHs were identified as PCOCs (acenaphthalene, anthracene, fluoranthene, naphthalene, phenanthrene, and pyrene). These PAHs had a low frequency of screening value exceedance. Based on the low magnitude and frequency of criteria exceedances for PAHs, the risk associated with PAHs is likely to be low.

6.1.5.2 Surface Water Exposures

Six metals (arsenic, copper, lead, mercury, dissolved nickel, and silver) were identified as PCOCs due to screening value exceedances. Most of the metals were detected only in the unfiltered (total) surface water samples from the site. Since these metals were not detected in any of the filtered (dissolved) surface water samples, they are not readily bioavailable to directly exposed aquatic organisms. As a result, these undetected dissolved metals were not considered further as PCOCs.

Manganese and nickel in dissolved form had a mean HQ of about 2.0. Their distribution was limited to one sample location in the lagoon system.

Di-n-octylphthalate was detected in a single surface water sample. No screening value is available for this chemical, which is a common laboratory contaminant.

6.1.5.3 Sediment Exposures

Three metals (arsenic, barium, and copper), three pesticides (DDD, DDE, and DDT), and bis(2-ethylhexyl)phthalate were identified as PCOCs. One sediment sample location (NDW06SD02) had several elevated metals which included antimony, arsenic, barium, beryllium, cadmium, cobalt, copper, lead, mercury, nickel, selenium, silver, thallium, and vanadium. This station is located at the edge of a metal bridge crossing for Highway 200 at the southwest corner of the site. In September 2003, this station was resampled to verify these elevated detections; the station was found to contain significantly lower metal concentrations than previously detected. In fact, all concentrations of these metals at this station were at or below background and were below screening values where available. Additional sediment samples were also collected in September 2003 in the immediate vicinity of NDW06SD02, including NDW06SD10 through NDW06SD13, and analytical results were comparable among these stations. Therefore, it appears that the sediment sample collected at NDW06SD02 in April 2000 does not accurately represent sediment metal concentrations at this location and that the later resample data should be considered more appropriate for this station.

Arsenic, barium, and copper each exceeded screening values and background (upgradient) concentrations. Three pesticides, DDD, DDE, and DDT, each exceeded screening values with mean HQs ranging from 1.3 to 13. The frequency of screening value exceedance was low, ranging from 1 to 3 samples (of 17 to 18 samples) for these pesticides. Based on the low frequency of screening value (PQL) exceedance and low magnitude of ERM screening value exceedance, these pesticides are not considered as PCOCs.

Six VOCs were identified as PCOCs since screening values were not available, and therefore these chemicals could not be evaluated quantitatively. Many of these VOCs are common laboratory contaminants, and since they are not related to solid waste materials discarded at the site, they may be artifacts of sample handling.

6.1.5.4 Food Web Exposures

Selenium detected in 2000 sampling was identified as a PCOC at station NDW06SD02. A repeat sample collected at the same location on September 3, 2003, resulted in a nondetection for selenium. In addition, the next lowest concentration detected in all 19 sediment samples from the surrounding lagoon system was 2.2 mg/kg. Therefore, based on the repeat sample along with upgradient/downgradient sediment samples, the initial high detection of selenium is isolated and does not appear to accurately represent site conditions. The selenium concentrations (maximum and mean) used in the food web model may greatly overestimate the exposure to semi-aquatic bird species. Calculation of food web exposure to selenium without the 544-mg/kg concentration results in NOAEL and LOAEL HQs less than 1.0. Based on the evaluation above, selenium is not considered to pose an unacceptable risk to upper trophic level wildlife.

6.1.5.5 DOI Biota Sampling Memorandum Review Summary

The memorandum prepared for the preliminary study conducted by the DOI that included three samples, two land crabs and one composite sample of fiddler crabs was reviewed for its applicability to the ecological risk evaluations (DOI, 2002). A summary of the review is included in Appendix L. The chemical concentrations detected by the DOI in the crab tissues are not at levels that would pose an unacceptable risk to birds foraging at the site. Chemicals of potential concern in crab tissues identified by the DOI include DDE, DDT, cadmium, lead, and vanadium. A conservative back-calculation using the food web model from the SWMU 6 ERA (as presented in Appendix L) was used to conservatively estimate the highest concentrations of these chemicals in crab tissue that would pose no adverse effects to three species of wading bird, the great blue heron, yellow-crowned heron, and green heron. A key assumption of the model was that the diets of these birds consisted entirely of crabs (i.e., no fish).

The food web model results indicated that for both DDE and DDT, no adverse effects would occur to these bird species consuming crabs with tissue concentrations at or below 1.03 mg/kg dry wt. The maximum DDE and DDT concentrations measured by the DOI in crabs were less, equaling 0.52 and 0.11 mg/kg, respectively. For cadmium, lead, and vanadium, the model indicated that no adverse effects would occur at respective crab tissue concentrations of 5.0, 13.3, and 39.5 mg/kg dry wt. The maximum concentrations measured in crabs by the DOI were less than these values (cadmium = 1.6 mg/kg dry wt; lead = 11.7 mg/kg dry wt; vanadium = 2.63 mg/kg dry wt).

Therefore, despite the technical issues and uncertainties with the crab tissue samples, concentrations detected in the crab tissues are not at levels that would likely pose an unacceptable risk to birds foraging at the site.

6.1.5.6 Summary of COCs

In summary, none of the COPCs carried forward from Step 2 were considered as final COCs following the Step 3A refinement, but it is recognized that this conclusion with respect to soil is uncertain because soil samples were collected adjacent to the waste piles, rather than directly within/beneath them. Although many metals and some organic chemicals were identified as COPCs, risks to lower trophic level receptors were negligible based on the low magnitude of screening value exceedances and comparisons to background/upgradient data. There were also no significant risks identified for terrestrial wildlife. As with the human health risk assessment conclusions, because of the uncertainty associated with the ecological risk conclusions and the uncertainty of the debris being a potential future source of contamination, the agencies have concurred that in order to address the uncertainty and ensure the residual media concentrations at the site are protective of the environment, a removal action will be performed.

6.2 Recommendations

Because of the uncertainty associated with the conclusions drawn based on the data collected during the RI and the uncertainty associated with the debris being a potential future source of contamination, the agencies have concurred that in order to address the uncertainty and ensure residual media concentrations at the site are protective of human health and the environment, a removal action will be performed.

SECTION 7

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October 7, 2003

CH2MHill
Mr. Martin J. Clasen
4350 West Cypress
Suite 600
Tampa, FL 33607

Subject: After Action Report for UXO Avoidance Services Former NASD Vieques Island, Puerto Rico

Dear Mr. Clasen,

USA Environmental, Inc (USA) has performed UXO Avoidance Services as specified within the scope work for this project and purchase order identified below. The period of field performance for this effort was August 11 through 29, 2003.

Authority

USA Contract Number 2018-012
OE/UXO Investigative Services in support of CTO-248
UXO Support Services
Project # 171119 Purchase Order # 68565
Navy Clean Prime Contract # N62470-95-D-6007

Site Operations

The USA UXO Team, mobilized to NASD Vieques Island, Puerto Rico on August 11, 2003[1]. The following day the USA UXO team interfaced with the CH2MHill site representatives, received maps of the environmental sites where UXO services were to be performed during the performance of this effort. Additionally, general site familiarization and preoperational equipment checks were performed in preparation for upcoming UXO services.

Throughout the period of performance commencing August 13, 2003, UXO anomaly avoidance was performed by the USA UXO team at environmental sites SWMU 7, SWMU 6 and AOC-J. The immediate areas where intrusive excavation for the purpose of drilling ground water sampling wells, soil borings, and intrusive excavation utilizing mechanical equipment were checked for subsurface anomalies. In SWMU-7 and SWMU-6, boreholes locations were repositioned due to presence of subsurface anomalies within the immediate area of the borehole location. Specifically, within SWMU-7, four downhole locations were repositioned from the original location due to the presence of subsurface anomalies and three times within SWMU-6. No borehole locations were repositioned in AOC-J due to the presence of subsurface anomalies.

Additionally, USA was tasked with performing a surface avoidance within the areas of each AOC, limited to an area of the AOC that accommodated work crews, vehicles, and equipment to ingress and egress safely to/from borehole locations. This action was completed on August 13, 2003 for all three areas prior to the arrival of work crews and equipment. Although there was no UXO or Ordnance and Explosives (OE) observed near borehole locations, Ordnance Related Scrap (ORS) was located on the surface, in

[1] USA UXO Team consisted of one UXO Technician III and one UXO Technician II.

AOC's SWMU-7 and AOC-J. No UXO/OE or ORS was located within the ingress and egress routes to and from the borehole locations at SWMU-6. Appendix A provides specific information regarding the type of ORS, quantity, condition and location of the ORS discovered in or near the routes were UXO avoidance was being performed.

Prior to commencing daily operations a safety meeting was performed with USA personnel and CH2MHill personnel performing operations in the AOC's. Additionally, a tailgate safety meeting was performed within each of the sites to address safety concerns unique to that specific site. Safety Meeting/ Training Record documents were the topics covered in the safety meeting and attendance (name signature and company) was recorded. Appendix B provides the safety documentation. During the period of performance of this effort, no safety violations or explosive accidents occurred.

Field efforts were concluded on August 27, 2003 and USA field crews demobilized the following day.

Having successfully completed this effort in a safe and effective manner, USA Environmental, Inc. looks forward to working with CH2MHill on future opportunities. Please feel free to contact me if you have any questions or concerns at 813-884-5722 x117.

Sincerely,

Richard Hanoski
Project Manager, Vieques Island Projects
USA Environmental, Inc.

Appendix A Surface Reconnaissance

Appendix B Safety Meeting/Training Records

APPENDIX A

SURFACE RECONNAISSANCE RESULTS

SURFACE RECONNAISSANCE RESULTS

AOC	*Item Description*	*Qty*	*Condition*	*Lat/Long Location*
SWMU-7	2.75” Rocket Pod	1	Empty	N18^0 07.041 / W065^0 32.182
	2.75” Rocket Pod	11	Empty	N18^0 07.050 / W065^0 32.185
	Propellant Charge Can	1	Empty	N18^0 07.056 / W065^0 32.191
	Propellant Charge Container	1	Empty	N18^0 07.063 / W065^0 32.196
	Unknown Type of Container (Orange Stripes)	1	Empty	N18^0 07.069 / W065^0 32.190
	2.75” Rocket Pod	2	Empty	N18^0 07.091 / W065^0 32.218
	Propellant Charge Can	1	Empty	N18^0 07.128 / W065^0 32.260
	2.75” Rocket Pod	1	Empty	N18^0 07.126 / W065^0 32.264
	7.62 Caliber or 30 Caliber Ready Can	1	Empty	N18^0 07.045 / W065^0 32.163
	Propellant Charge Can	1	Empty	N18^0 07.065 / W065^0 32.189
AOC-J	106 mm Cartridge Casing (M594)	1	Empty	N18^0 07.125 / W065^0 33.104

APPENDIX B

Safety Meeting/Training Records

USA Environmental, Inc.

SAFETY MEETING/TRAINING RECORD

DATE: 08 / 12 / 03 **TIME:** 0800 (AM) PM

LOCATION/SITE: MAG 239

1. Reason for Meeting/Training: (Check all that apply)	
	Daily Safety Meeting/Training
	Initial Site Safety Meeting/Training
	New Task Briefing
✓	Periodic Safety Meeting/Training
	New Site Procedures
	New Site Information
	Periodic Review of Site Information
	Other (Explain):

2. Personnel Attending Meeting/Training:

Name	Signature	Company
ARNOLD NIEDERHOFER		USA ENVIRON
ERIK ISERN		CH2M HILL
Craig Wilson		USA Environ.

USA Environmental Inc.

Safety Meeting/Training Record Con't:

3. Topics Covered (Check all that apply)

	Site Safety Personnel		Decontamination Procedures
	Site/Work Area Description		Emergency Response Plan
	Site Characterization		Hazard Communition
	Biological Hazard(s)		On-Site Emergency
	Chemical Hazard(s)		On-Site Injuries/Illnesses
✓	Physical Hazard(s)		Evacuation Procedures
✓	Heat Stress		Rally Point(s)
	Cold Stress		Emergency Communication
	Site Control		Directions to Medical Facility
	Work and Support Zones		Drug and Alcohol Policies
	PPE		Medical Monitoring Program
	Air monitoring		Specific Task Training
	Safe Work Practices		Confined Spaces
	Engineering Controls and Equipment		Heavy Equipment
	Spill Containment Procedures		Other: (Specify)

4. Remarks:

5. Verification:

I certify that the personnel listed above on this record received the Information and/or Training described as indicated. Personnel not attending this meeting/training will receive said information/training prior to commencing their assigned duties.

Arnold Nakkab
Site Safety Officer

Date: 08 / 12 / 03

USA Environmental, Inc.

SAFETY MEETING/TRAINING RECORD

DATE: 08/13/03 **TIME:** 0800 **AM PM**

LOCATION/SITE: _____

1. Reason for Meeting/Training: (Check all that apply)	
	Daily Safety Meeting/Training
	Initial Site Safety Meeting/Training
	New Task Briefing
✓	Periodic Safety Meeting/Training
	New Site Procedures
	New Site Information
	Periodic Review of Site Information
	Other (Explain):

2. Personnel Attending Meeting/Training:

Name	Signature	Company
Stacia R. Martin		CH2M HILL
Alexander Rose		USA ENVIRON.
Greg Wilson		USA-E

USA Environmental Inc.

Safety Meeting/Training Record Con't:

3. Topics Covered (Check all that apply)

	Site Safety Personnel		Decontamination Procedures
	Site/Work Area Description		Emergency Response Plan
	Site Characterization		Hazard Communition
	Biological Hazard(s)		On-Site Emergency
	Chemical Hazard(s)		On-Site Injuries/Illnesses
	Physical Hazard(s)		Evacuation Procedures
	Heat Stress		Rally Point(s)
	Cold Stress		Emergency Communication
	Site Control		Directions to Medical Facility
	Work and Support Zones		Drug and Alcohol Policies
	PPE		Medical Monitoring Program
	Air monitoring		Specific Task Training
	Safe Work Practices		Confined Spaces
	Engineering Controls and Equipment		Heavy Equipment
	Spill Containment Procedures		Other: (Specify)

4. Remarks:

5. Verification:

I certify that the personnel listed above on this record received the Information and/or Training described as indicated. Personnel not attending this meeting/training will receive said information/training prior to commencing their assigned duties.

Site Safety Officer

Date: 08 / 13 / 03

USA Environmental, Inc.

SAFETY MEETING/TRAINING RECORD

DATE: 08/14/03 **TIME:** 0845 AM PM

LOCATION/SITE: _____

1. Reason for Meeting/Training: (Check all that apply)	
✓	Daily Safety Meeting/Training
✓	Initial Site Safety Meeting/Training
	New Task Briefing
	Periodic Safety Meeting/Training
	New Site Procedures
	New Site Information
	Periodic Review of Site Information
	Other (Explain):

2. Personnel Attending Meeting/Training:

Name	Signature	Company
ARNOLD NIEDERHOFER	A Niederhofer	USAE
Greg Wilson		USAE
Mariana Brown	Mariana Brown	CH2M HILL
Rick GORSIRA	Richard C. Gorsira	" "
Chris Phelps	Chris Phelps	E.D.S.
CLARENCE D MARSHALL	Clarence D. Marshall	EDS
HENRY L. KEMP	Henry L. Kemp	E.D.S.
ROGER HUNTON		EDS
W David Burkholder	W David Burkholder	EMS

USA Environmental Inc.

Safety Meeting/Training Record Con't:

3. Topics Covered (Check all that apply)			
	Site Safety Personnel		Decontamination Procedures
	Site/Work Area Description		Emergency Response Plan
	Site Characterization		Hazard Communition
	Biological Hazard(s)		On-Site Emergency
	Chemical Hazard(s)		On-Site Injuries/Illnesses
	Physical Hazard(s)		Evacuation Procedures
	Heat Stress		Rally Point(s)
	Cold Stress		Emergency Communication
	Site Control		Directions to Medical Facility
	Work and Support Zones		Drug and Alcohol Policies
	PPE		Medical Monitoring Program
	Air monitoring		Specific Task Training
	Safe Work Practices		Confined Spaces
	Engineering Controls and Equipment		Heavy Equipment
	Spill Containment Procedures		Other: (Specify)

4. Remarks:

5. Verification:

I certify that the personnel listed above on this record received the Information and/or Training described as indicated. Personnel not attending this meeting/training will receive said information/training prior to commencing their assigned duties.

_____

Site Safety Officer

Date: ____/____/____

USA Environmental, Inc.

SAFETY MEETING/TRAINING RECORD

DATE: 8/15/03 **TIME:** 0640 (AM) PM

LOCATION/SITE: NASD SWMU-7

1. Reason for Meeting/Training: (Check all that apply)	
X	Daily Safety Meeting/Training
	Initial Site Safety Meeting/Training
	New Task Briefing
	Periodic Safety Meeting/Training
	New Site Procedures
	New Site Information
	Periodic Review of Site Information
	Other (Explain):

2. Personnel Attending Meeting/Training:

Name	Signature	Company
MARIANA BROWN	Mariana Brown	CH2M HILL
ROGER D. HUTCHISON		EDS
CLARENCE MARSHALL	Clarence Marshall	EDS
WAYNE Buckhalter	Wayne Buckhalter	EDS
Stevin R. Martin	Stevin R. Martin	CH2M Hill
ARNOLD Niederhofer	Arnold Niederhofer	USAE

USA Environmental Inc.

Safety Meeting/Training Record Con't:

3. Topics Covered (Check all that apply)			
✓	Site Safety Personnel		Decontamination Procedures
✓	Site/Work Area Description	✓	Emergency Response Plan
	Site Characterization		Hazard Communition
	Biological Hazard(s)	✓	On-Site Emergency
	Chemical Hazard(s)	✓	On-Site Injuries/Illnesses
✓	Physical Hazard(s)	✓	Evacuation Procedures
✓	Heat Stress		Rally Point(s)
	Cold Stress		Emergency Communication
	Site Control	✓	Directions to Medical Facility
✓	Work and Support Zones		Drug and Alcohol Policies
✓	PPE		Medical Monitoring Program
	Air monitoring		Specific Task Training
	Safe Work Practices		Confined Spaces
	Engineering Controls and Equipment		Heavy Equipment
	Spill Containment Procedures		Other: (Specify)

4. Remarks: Vehicle orientation, fire extinguisher

5. Verification:

I certify that the personnel listed above on this record received the Information and/or Training described as indicated. Personnel not attending this meeting/training will receive said information/training prior to commencing their assigned duties.

Site Safety Officer

Date: 8/15/03

USA Environmental, Inc.

SAFETY MEETING/TRAINING RECORD

DATE: 8/16/03 **TIME:** 0650 (AM) PM

LOCATION/SITE: NASD, Vieques

1. Reason for Meeting/Training: (Check all that apply)	
✓	Daily Safety Meeting/Training
	Initial Site Safety Meeting/Training
	New Task Briefing
	Periodic Safety Meeting/Training
	New Site Procedures
	New Site Information
	Periodic Review of Site Information
	Other (Explain):

2. Personnel Attending Meeting/Training:

Name	Signature	Company
ROGER NUTCHISON		E.D.S.
Chris Phelps	Chris Phelps	E. D. S.
HENRY L. KEMP		E. D. S.
Candace Marshall	Candace Marshall	EDS
W David Bakholdin		EDS
Stacia R. Martin		CH2M Hill
ERIK ISERN		CH2M HILL
ARNOLD NIEDERHOFER	Arnold A. Niederhofer	USAE
MARIANA BROWN		CH2M HILL
Rick CORSIRA	Richard L. Sm	" "

USA Environmental, Inc.

SAFETY MEETING/TRAINING RECORD

DATE: 8/18/03 **TIME:** 0930 AM PM

LOCATION/SITE: NASD, Vieques PR

1. Reason for Meeting/Training: (Check all that apply)	
✓	Daily Safety Meeting/Training
	Initial Site Safety Meeting/Training
	New Task Briefing
	Periodic Safety Meeting/Training
	New Site Procedures
	New Site Information
	Periodic Review of Site Information
	Other (Explain):

2. Personnel Attending Meeting/Training:

Name	Signature	Company
ERIK ISERN		CH2M HILL
Chris Phelps		E.D.S
CLARENCE MARSHALL		EDS
ROGER HUTCHISON-		E.D.S.
HENRY L. KEMP		E.D.S.
Stacia R. Martin		CH2M Hill
W David Burkholder		EDS
A Niederhofer		USAE
RICK GARSIRA		CH2M Hill
Mariana Brown		CH2M HILL

USA Environmental Inc.

Safety Meeting/Training Record Con't:

3. Topics Covered (Check all that apply)			
✓	Site Safety Personnel		Decontamination Procedures
✓	Site/Work Area Description	✓	Emergency Response Plan
	Site Characterization		Hazard Communition
	Biological Hazard(s)	✓	On-Site Emergency
	Chemical Hazard(s)	✓	On-Site Injuries/Illnesses
	Physical Hazard(s)	✓	Evacuation Procedures
✓	Heat Stress		Rally Point(s)
	Cold Stress		Emergency Communication
	Site Control	✓	Directions to Medical Facility
✓	Work and Support Zones		Drug and Alcohol Policies
✓	PPE		Medical Monitoring Program
	Air monitoring		Specific Task Training
	Safe Work Practices		Confined Spaces
	Engineering Controls and Equipment		Heavy Equipment
	Spill Containment Procedures		Other: (Specify)

4. Remarks:

5. Verification:

I certify that the personnel listed above on this record received the Information and/or Training described as indicated. Personnel not attending this meeting/training will receive said information/training prior to commencing their assigned duties.

Site Safety Officer

Date: 8/15/03

USA Environmental, Inc.

SAFETY MEETING/TRAINING RECORD

DATE: 8/19/03 **TIME:** 0715 (AM) PM

LOCATION/SITE: NASD, Vieques, PR

1. Reason for Meeting/Training: (Check all that apply)	
X	Daily Safety Meeting/Training
	Initial Site Safety Meeting/Training
	New Task Briefing
	Periodic Safety Meeting/Training
	New Site Procedures
	New Site Information
	Periodic Review of Site Information
	Other (Explain):

2. Personnel Attending Meeting/Training:

Name	Signature	Company
A Niederhofer	Arnold A. Niederhofer	USAE
M Brown	Mariana M B	CH2M HILL
ERIK ISERN		CH2M HILL
Rick GOASIRA	Richard C. Goas	CH2M Hill
Stacia Martin		CH2M Hill
W David Burkholder	W David Burkholder	EDS
Henry L Kemp	Henry L Kemp	E-D-S
Chris Phelps	Chris Phelps	EDS
Clarence Marshall	Clarence Marshall	EDS
Roger Hutcheson		EDS

USA Environmental Inc.

Safety Meeting/Training Record Con't:

3. Topics Covered (Check all that apply)			
✓	Site Safety Personnel		Decontamination Procedures
✓	Site/Work Area Description	✓	Emergency Response Plan
	Site Characterization		Hazard Communition
	Biological Hazard(s)	✓	On-Site Emergency
	Chemical Hazard(s)	✓	On-Site Injuries/Illnesses
✓	Physical Hazard(s)	✓	Evacuation Procedures
✓	Heat Stress		Rally Point(s)
	Cold Stress		Emergency Communication
	Site Control	✓	Directions to Medical Facility
✓	Work and Support Zones		Drug and Alcohol Policies
✓	PPE		Medical Monitoring Program
	Air monitoring		Specific Task Training
	Safe Work Practices		Confined Spaces
	Engineering Controls and Equipment		Heavy Equipment
	Spill Containment Procedures		Other: (Specify)

4. Remarks:

5. Verification:

I certify that the personnel listed above on this record received the Information and/or Training described as indicated. Personnel not attending this meeting/training will receive said information/training prior to commencing their assigned duties.

Site Safety Officer

Date: 8/17/03

USA Environmental, Inc.

SAFETY MEETING/TRAINING RECORD

DATE: 8 / 20 / 03 **TIME:** 0650 AM PM

LOCATION/SITE: NASD, Virginia

1. Reason for Meeting/Training: (Check all that apply)	
✓	Daily Safety Meeting/Training
	Initial Site Safety Meeting/Training
	New Task Briefing
	Periodic Safety Meeting/Training
	New Site Procedures
	New Site Information
	Periodic Review of Site Information
	Other (Explain):

2. Personnel Attending Meeting/Training:

Name	Signature	Company
A Niederhofer	A. Niederhofer	USAE
ERIK ISERN		CH2M HILL
MARIANA BROWN	Mariana Brown	CH2M HILL
ROGER HUTCHISON		E.D.S.
HENRY L. KEMP		E-D-S
Chris Phelps	Chris Phelps	E. D. S.
CLARENCE MARSHALL	Clarence C. Marshall	EDS
W David Burkholder	W David Burkholder	EDS
Michael GOLDMAN		CH2M HILL
Rick GORSIRA	Richard J. Gorsira	CH2M Hill
Steven RUMAN	S R Ruman	CH2M Hill

USA Environmental Inc.

Safety Meeting/Training Record Con't:

3. Topics Covered (Check all that apply)

✓	Site Safety Personnel		Decontamination Procedures
✓	Site/Work Area Description	✓	Emergency Response Plan
	Site Characterization		Hazard Communition
	Biological Hazard(s)	✓	On-Site Emergency
	Chemical Hazard(s)	✓	On-Site Injuries/Illnesses
✓	Physical Hazard(s)		Evacuation Procedures
✓	Heat Stress		Rally Point(s)
	Cold Stress		Emergency Communication
	Site Control	✓	Directions to Medical Facility
✓	Work and Support Zones		Drug and Alcohol Policies
✓	PPE		Medical Monitoring Program
	Air monitoring		Specific Task Training
✓	Safe Work Practices		Confined Spaces
	Engineering Controls and Equipment		Heavy Equipment
	Spill Containment Procedures		Other: (Specify)

4. Remarks:

5. Verification:

I certify that the personnel listed above on this record received the Information and/or Training described as indicated. Personnel not attending this meeting/training will receive said information/training prior to commencing their assigned duties.

Site Safety Officer

Date: 5 / 20 / 03

USA Environmental, Inc.

SAFETY MEETING/TRAINING RECORD

DATE: 8/21/03 **TIME:** 0653 AM PM

LOCATION/SITE: NASD, Vieques, PR

1. Reason for Meeting/Training: (Check all that apply)	
✓	Daily Safety Meeting/Training
	Initial Site Safety Meeting/Training
	New Task Briefing
	Periodic Safety Meeting/Training
	New Site Procedures
	New Site Information
	Periodic Review of Site Information
	Other (Explain):

2. Personnel Attending Meeting/Training:

Name	Signature	Company
A. Niederhofer		USAE
S. Martin		CH2M Hill
W. David Bordelon		EOS
Henry L. Kemp		E-D-S
Roger Hutchison		E.D.S.

USA Environmental Inc.

Safety Meeting/Training Record Con't:

3. Topics Covered (Check all that apply)			
✓	Site Safety Personnel		Decontamination Procedures
✓	Site/Work Area Description	✓	Emergency Response Plan
✓	Site Characterization		Hazard Communition
	Biological Hazard(s)	✓	On-Site Emergency
	Chemical Hazard(s)	✓	On-Site Injuries/Illnesses
✓	Physical Hazard(s)		Evacuation Procedures
✓	Heat Stress		Rally Point(s)
	Cold Stress		Emergency Communication
	Site Control	✓	Directions to Medical Facility
	Work and Support Zones		Drug and Alcohol Policies
✓	PPE		Medical Monitoring Program
	Air monitoring		Specific Task Training
	Safe Work Practices		Confined Spaces
	Engineering Controls and Equipment		Heavy Equipment
	Spill Containment Procedures		Other: (Specify)

4. Remarks:

5. Verification:

I certify that the personnel listed above on this record received the Information and/or Training described as indicated. Personnel not attending this meeting/training will receive said information/training prior to commencing their assigned duties.

Site Safety Officer

Date: 8/21/03

USA Environmental, Inc.

SAFETY MEETING/TRAINING RECORD

DATE: 8/22/03 **TIME:** 0852 AM PM

LOCATION/SITE: NASD, Virginia Beach, VA

1. Reason for Meeting/Training: (Check all that apply)	
✓	Daily Safety Meeting/Training
	Initial Site Safety Meeting/Training
	New Task Briefing
	Periodic Safety Meeting/Training
	New Site Procedures
	New Site Information
	Periodic Review of Site Information
	Other (Explain):

2. Personnel Attending Meeting/Training:

Name	Signature	Company
A. Niederhofer	A. Niederhofer	USAE
ERIK ISERN		CH2M HILL
ROGER HUTCHISON		EDS
Harry L. Kemp		EDS
Mandra Brown		CH2M Hill
Rick GORSIRA		CH2M Hill
W David Buckholder	W David Buckholder	EDS
Clarence Marshall	Clarence Marshall	EDS
Chris Phelps	Chris Phelps	EDS

USA Environmental, Inc.

SAFETY MEETING/TRAINING RECORD

DATE: 8/23/03 **TIME:** 0705 AM PM

LOCATION/SITE: NASD, Vieques, PR

1. Reason for Meeting/Training: (Check all that apply)	
✓	Daily Safety Meeting/Training
	Initial Site Safety Meeting/Training
	New Task Briefing
	Periodic Safety Meeting/Training
	New Site Procedures
	New Site Information
	Periodic Review of Site Information
	Other (Explain):

2. Personnel Attending Meeting/Training:

Name	Signature	Company
A. Niederhofer	A. Niederhofer Jr	USAE
E. ISERN		CH2M HILL
ROGER HUTCHISON		E IDS
Henry L. Kemp		E-D-S
Mariana Brown		CH2M Hill
Rick GORSICA		CH2M Hill
W. David Burkholder	W David Burkholder	EDS
VALENCE MARSHALL		EDS
Chris Phelps	Chris Phelps	EDS

USA Environmental Inc.

Safety Meeting/Training Record Con't:

3. Topics Covered (Check all that apply)			
✓	Site Safety Personnel		Decontamination Procedures
✓	Site/Work Area Description	✓	Emergency Response Plan
	Site Characterization		Hazard Communition
	Biological Hazard(s)	✓	On-Site Emergency
	Chemical Hazard(s)	✓	On-Site Injuries/Illnesses
✓	Physical Hazard(s)	✓	Evacuation Procedures
✓	Heat Stress		Rally Point(s)
	Cold Stress		Emergency Communication
	Site Control	✓	Directions to Medical Facility
	Work and Support Zones		Drug and Alcohol Policies
✓	PPE		Medical Monitoring Program
	Air monitoring		Specific Task Training
	Safe Work Practices		Confined Spaces
	Engineering Controls and Equipment		Heavy Equipment
	Spill Containment Procedures		Other: (Specify)

4. Remarks:

5. Verification:

I certify that the personnel listed above on this record received the Information and/or Training described as indicated. Personnel not attending this meeting/training will receive said information/training prior to commencing their assigned duties.

Site Safety Officer

Date: 8/23/03

USA Environmental, Inc.

SAFETY MEETING/TRAINING RECORD

DATE: 8/25/03 **TIME:** 0840 AM PM

LOCATION/SITE: NASD, Vieques, PR

1. Reason for Meeting/Training: (Check all that apply)	
✓	Daily Safety Meeting/Training
	Initial Site Safety Meeting/Training
	New Task Briefing
	Periodic Safety Meeting/Training
	New Site Procedures
	New Site Information
	Periodic Review of Site Information
	Other (Explain):

2. Personnel Attending Meeting/Training:

Name	Signature	Company
A Niederhofer	A Niederhofer	USAE
W David Burkholder	W David Burkholder	EDS
Clarence Marshall	Clarence Marshall	EDS
Rick Gorska	Richard L. Gorska	CH2M Hill
Isaac Lynch	Isaac Lynch	CH2m Hill
Stephanie Salazar	Stephanie Salazar	FIU - HCET
Roger D Hutchison		E.D.S.
Florencia Sensidi	Florencia Sensidi	FIU-HCET
ERIK ISERN	ES	CH2M HILL
Manana Brown	Manana	CH2M HILL

USA Environmental Inc.

Safety Meeting/Training Record Con't:

3. Topics Covered (Check all that apply)

✓	Site Safety Personnel		Decontamination Procedures
✓	Site/Work Area Description	✓	Emergency Response Plan
	Site Characterization		Hazard Communition
	Biological Hazard(s)	✓	On-Site Emergency
	Chemical Hazard(s)	✓	On-Site Injuries/Illnesses
	Physical Hazard(s)	✓	Evacuation Procedures
✓	Heat Stress		Rally Point(s)
	Cold Stress		Emergency Communication
	Site Control	✓	Directions to Medical Facility
	Work and Support Zones		Drug and Alcohol Policies
✓	PPE		Medical Monitoring Program
	Air monitoring		Specific Task Training
	Safe Work Practices		Confined Spaces
	Engineering Controls and Equipment		Heavy Equipment
	Spill Containment Procedures		Other: (Specify)

4. Remarks:

5. Verification:

I certify that the personnel listed above on this record received the Information and/or Training described as indicated. Personnel not attending this meeting/training will receive said information/training prior to commencing their assigned duties.

Site Safety Officer

Date: 8/25/03

USA Environmental, Inc.

SAFETY MEETING/TRAINING RECORD

DATE: 8/26/03 **TIME:** 0700 **AM PM**

LOCATION/SITE: NASJ, Vieques, PR

1. Reason for Meeting/Training: (Check all that apply)	
✓	Daily Safety Meeting/Training
	Initial Site Safety Meeting/Training
	New Task Briefing
	Periodic Safety Meeting/Training
	New Site Procedures
	New Site Information
	Periodic Review of Site Information
	Other (Explain):

2. Personnel Attending Meeting/Training:

Name	Signature	Company
A. Niederhofer	A. Niederhofer	USAE
ISAAC LYNCH	Isaac Lynch	CH2M Hill
Florencia Sangiali	Florencia Sangiali	HCET
ERIK ISERN		CH2M HILL
Stephanie Salazar	Stephanie Salazar	FIU-HCET
Roger Hutchison		E.I.D.S.
RICK GORSIRA	Richard Gorsira	CH2M Hill

USA Environmental Inc.

Safety Meeting/Training Record Con't:

3. Topics Covered (Check all that apply)

	Site Safety Personnel		Decontamination Procedures
	Site/Work Area Description		Emergency Response Plan
	Site Characterization		Hazard Communition
	Biological Hazard(s)		On-Site Emergency
	Chemical Hazard(s)		On-Site Injuries/Illnesses
	Physical Hazard(s)		Evacuation Procedures
	Heat Stress		Rally Point(s)
	Cold Stress		Emergency Communication
	Site Control		Directions to Medical Facility
	Work and Support Zones		Drug and Alcohol Policies
	PPE		Medical Monitoring Program
	Air monitoring		Specific Task Training
	Safe Work Practices		Confined Spaces
	Engineering Controls and Equipment		Heavy Equipment
	Spill Containment Procedures		Other: (Specify)

4. Remarks:

5. Verification:

I certify that the personnel listed above on this record received the Information and/or Training described as indicated. Personnel not attending this meeting/training will receive said information/training prior to commencing their assigned duties.

Site Safety Officer

Date: 8/26/03

USA Environmental, Inc.

SAFETY MEETING/TRAINING RECORD

DATE: 8/22/03 **TIME:** 0700 AM PM

LOCATION/SITE: NASD, Vieques, PR

1. Reason for Meeting/Training: (Check all that apply)	
✓	Daily Safety Meeting/Training
	Initial Site Safety Meeting/Training
	New Task Briefing
	Periodic Safety Meeting/Training
	New Site Procedures
	New Site Information
	Periodic Review of Site Information
	Other (Explain):

2. Personnel Attending Meeting/Training:

Name	Signature	Company
A. Niederhöfer	A. Niederhofer	USAE
ERIK ISERN		CH2M HILL
Florencia Sengiali	Florencia Sengiali	HCET
Mariana Brown	Mariana Brown	CH2M HILL
Stephanie Salazar	Stephanie Salazar	FIU-HCET
ISAAC LYNCH	Isaac Lynch	CH2M HILL
RICK BORGIDA	Richard J. Gen	CH2M HILL
CLARENCE MARSHALL	Clarence A. Marshall	EPS
W David Buckholder		
ROGER HUTCHINSON		R.D.S.

USA Environmental Inc.

Safety Meeting/Training Record Con't:

3. Topics Covered (Check all that apply)

✓	Site Safety Personnel		Decontamination Procedures
✓	Site/Work Area Description	✓	Emergency Response Plan
✓	Site Characterization		Hazard Communition
	Biological Hazard(s)	✓	On-Site Emergency
	Chemical Hazard(s)	✓	On-Site Injuries/Illnesses
✓	Physical Hazard(s)	✓	Evacuation Procedures
✓	Heat Stress		Rally Point(s)
	Cold Stress		Emergency Communication
	Site Control	✓	Directions to Medical Facility
	Work and Support Zones		Drug and Alcohol Policies
✓	PPE		Medical Monitoring Program
	Air monitoring		Specific Task Training
	Safe Work Practices		Confined Spaces
	Engineering Controls and Equipment		Heavy Equipment
	Spill Containment Procedures		Other: (Specify)

4. Remarks:

5. Verification:

I certify that the personnel listed above on this record received the Information and/or Training described as indicated. Personnel not attending this meeting/training will receive said information/training prior to commencing their assigned duties.

Site Safety Officer

Date: 8/22/03

USA Environmental, Inc.

SAFETY MEETING/TRAINING RECORD

DATE: 8/28/03 **TIME:** 0732 AM PM

LOCATION/SITE: NASD, Vieques, P.R.

1. Reason for Meeting/Training: (Check all that apply)	
✓	Daily Safety Meeting/Training
	Initial Site Safety Meeting/Training
	New Task Briefing
	Periodic Safety Meeting/Training
	New Site Procedures
	New Site Information
	Periodic Review of Site Information
	Other (Explain):

2. Personnel Attending Meeting/Training:

Name	Signature	Company
Mariana Brown	MarianaMBrown	CH2M HILL
Evgenia Songiaki	Evgenia Songiaki	HCET
Mick Corsiga	Mick Corsiga	CH2M HILL
Roger Hutchison		E.I.D.S.
Clarance Marshall		E.I.D.S.
Stephanie Salazar	Stephanie Salazar	HCET-FIL
ERIK ISERN		CH2M HILL
Clarence Marshall	Clarence C. Marshall	EDS
ISAAC LYNCH	Isaac Lynch	CH2M HILL
A. Niederhofer	A Niederhofer	USAE

USA Environmental Inc.

Safety Meeting/Training Record Con't:

3. Topics Covered (Check all that apply)			
✓	Site Safety Personnel	✓	Decontamination Procedures
✓	Site/Work Area Description	✓	Emergency Response Plan
✓	Site Characterization		Hazard Communition
	Biological Hazard(s)	✓	On-Site Emergency
	Chemical Hazard(s)	✓	On-Site Injuries/Illnesses
	Physical Hazard(s)		Evacuation Procedures
✓	Heat Stress		Rally Point(s)
	Cold Stress		Emergency Communication
	Site Control	✓	Directions to Medical Facility
✓	Work and Support Zones		Drug and Alcohol Policies
✓	PPE		Medical Monitoring Program
	Air monitoring		Specific Task Training
	Safe Work Practices		Confined Spaces
	Engineering Controls and Equipment		Heavy Equipment
	Spill Containment Procedures		Other: (Specify)

4. Remarks:

5. Verification:

I certify that the personnel listed above on this record received the Information and/or Training described as indicated. Personnel not attending this meeting/training will receive said information/training prior to commencing their assigned duties.

Site Safety Officer

Date: 3/28/03

CH2MHILL

PROJECT NUMBER	BORING NUMBER	
171119.FI.ZZ	NDW06MW05	SHEET 1 OF 1

SOIL BORING LOG

PROJECT : **NASD, VIEQUES, RI/FS INVESTIGATION** LOCATION : **SWMU 6** DATE: **08/23/2003**

WEATHER: **Cloudy, 80 °F** DRILLING CONTRACTOR : **Environmental Drilling Service (EDS), Orlando, FL**

DRILLING METHOD AND EQUIPMENT USED: **Stainless steel hand auger.**

WATER LEVELS **0.75' bgs** START : **8/23/03 @ 0845** END : **8/23/03 @ 0915** LOGGER : **E. Isern**

DEPTH BELOW SURFACE (FT)	INTERVAL (FT)	RECOVERY (IN)	#/TYPE	STANDARD PENETRATION TEST RESULTS 6"-6"-6"-6" (N)	CORE DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION. OVM (ppm): Breathing Zone Above Hole
0.0						
		N/A	N/A	N/A	0 to 0.75' SILTY SAND (SM), very dark grayish brown (2.5Y 3/2), moist, loose.	PID = 0.2 ppm
					0.75' to 1.5' SILTY SAND (SM), very dark grayish brown (2.5Y 3/2), wet, loose.	Note: Wet at 0.75' bgs.
2					1.5' to 13.0' WELL GRADED SAND (SW), light brownish gray (2.5Y 6/2), wet, loose, some shell hash.	PID = 0.2 ppm
4						PID = 0.2 ppm
						PID = 0.2 ppm
6						
8						
10						
12						
	13.0					
					END OF SOIL BORING @ 13.0' bgs.	
14						

Sampler Signature: **E. Isern** Date: **08/23/2003**

CH2MHILL

PROJECT NUMBER	BORING NUMBER	
171119.FI.ZZ	NDW06MW06	SHEET 1 OF 1

SOIL BORING LOG

PROJECT : **NASD, VIEQUES, RI/FS INVESTIGATION** LOCATION : **SWMU 6** DATE: **08/20/2003**

WEATHER: **Cloudy, 80 °F** DRILLING CONTRACTOR : **Environmental Drilling Service (EDS), Orlando, FL**

DRILLING METHOD AND EQUIPMENT USED : **CME - 75 drill rig, 4-1/4" ID H.S.A.'s, with hydraulic hammer**

WATER LEVELS **2.0' bgs** START : **8/20/03 @ 0935** END : **8/20/03 @ 1015** LOGGER : **E. Isern**

DEPTH BELOW SURFACE (FT)	INTERVAL (FT)	RECOVERY (IN)	#/TYPE	STANDARD PENETRATION TEST RESULTS 6"-6"-6"-6" (N)	CORE DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION. OVM (ppm): Breathing Zone Above Hole
0.0						
		N/A	N/A	N/A	0.0 to 2.0' SILTY SAND (SM), very dark grayish brown (2.5 Y 3/2), moist, loose, some shell hash.	PID = 0.4 ppm
2					2.0 to 13.0' WELL-GRADED SAND (SW), light bluish gray (5B 7/1), wet, loose, some shell hash.	Note: Wet at 2.0' bgs.
						PID = 0.2 ppm
4						PID = 0.2 ppm
						PID = 0.2 ppm
6						
8						
10						
12						
	13.0'					
					END OF SOIL BORING @ 13.0' bgs.	
14						

Sampler Signature: **E.Isern** Date: **08/20/2003**

CH2MHILL

PROJECT NUMBER	BORING NUMBER	
171119.FI.ZZ	NDW06MW07	SHEET 1 OF 1

SOIL BORING LOG

PROJECT : **NASD, VIEQUES, RI/FS INVESTIGATION** LOCATION : **SWMU 6** DATE: **08/20/2003**

WEATHER: **Sunny, 80 °F** DRILLING CONTRACTOR : **Environmental Drilling Service (EDS), Orlando, FL**

DRILLING METHOD AND EQUIPMENT USED : **CME - 75 drill rig, 4-1/4" ID H.S.A.'s, with hydraulic hammer**

WATER LEVELS : **2.0' bgs** START : **8/20/03 @ 0810** END : **8/20/03 @ 0905** LOGGER : **E. Isern**

DEPTH BELOW SURFACE (FT)	INTERVAL (FT)	RECOVERY (IN)	#/TYPE	STANDARD PENETRATION TEST RESULTS 6"-6"-6"-6" (N)	CORE DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION. OVM (ppm): Breathing Zone Above Hole
0.0						
	2.0	N/A	post hole digger	N/A	0 to 2.0' SILTY SAND (SM), very dark grayish brown (2.5Y 3/2), moist, loose, some shell fragments.	PID = 0.4 ppm
2						
	4.0	24"	SS1	2 - 4 - 5 - 7 (9)	2.0 to 4.0' SILTY SAND (SM), very dark grayish brown (2.5Y 3/2), wet, loose, some shell fragments.	Note: Wet at 2.0' bgs. PID = 0.2 ppm
4						
	6.0	24"	SS2	2 - 3 - 4 - 5 (7)	4.0 to 6.0 Same as above.	PID = 0.2 ppm
6						
	8.0	12"	SS3	2 - 2 - 2 - 2 (4)	6.0 to 6.5' Same as above. 6.5 to 8.0' LEAN CLAY (CL), dark greenish gray (5GY 4/1), wet, soft.	PID = 0.2 ppm
8						
	13.0				8.0 to 13.0' WELL-GRADED SAND (SW), light bluish gray (5B 7/1), wet, loose, some shell hash.	
10						
12						
					END OF SOIL BORING @ 13.0' bgs.	
14						

Sampler Signature: **E. Isern** Date: **08/20/2003**

CH2MHILL

PROJECT NUMBER	BORING NUMBER	
171119.FI.ZZ	NDW06MW08	SHEET 1 OF 1

SOIL BORING LOG

PROJECT : **NASD, VIEQUES, RI/FS INVESTIGATION** LOCATION : **SWMU 6** DATE: **08/19/2003**

WEATHER: **Sunny, 85 °F** DRILLING CONTRACTOR : **Environmental Drilling Service (EDS), Orlando, FL**

DRILLING METHOD AND EQUIPMENT USED : **CME - 75 drill rig, 4-1/4" ID H.S.A.'s, with hydraulic hammer**

WATER LEVELS : **2.0' bgs** START : **8/19/03 @ 1515** END : **8/19/03 @ 1600** LOGGER : **E. Isern**

DEPTH BELOW SURFACE (FT)	INTERVAL (FT)	RECOVERY (IN)	#/TYPE	STANDARD PENETRATION TEST RESULTS 6"-6"-6"-6" (N)	CORE DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION. OVM (ppm): Breathing Zone Above Hole
0.0						
	2.0	N/A	post hole digger	N/A	0.0 to 2.0 SILTY SAND (SM), very dark gravish brown (2.5 Y 3/2), moist, loose, some shell hash.	PID = 0.2 ppm
2						
	4.0	24	SS1	2-2-3-4 (5)	2.0 to 3.0' Same as above. 3.0 to 4.0' WELL GRADED SAND (SW), light bluish gray (5B 7/1), wet, loose, some shell hash.	PID = 0.2 ppm note: wet at 3.0' bgs.
4						
	6.0	24	SS2	3-4-4-5 (8)	4.0 to 6.0' WELL GRADED SAND WITH SILT (SW-SM), light bluish gray (5B 7/1), wet, loose, some shell hash.	PID = 0.2 ppm
6						
	8.0	24	SS3	3-4-5-5 (9)	6.0 to 8.0 Same as above.	PID = 0.2 ppm
8						
					8.0 to 13.0 Same as above.	
10						
12						
					END OF SOIL BORING @ 13.0' bgs..	
14						

Sampler Signature: **E. Isern** Date: **08/19/2003**

PROJECT NUMBER	BORING NUMBER	
171119.FI.ZZ	NDW06SS09	SHEET 1 OF 1

SURFACE SOIL LOG

PROJECT : NASD RI/FS INVESTIGATION LOCATION : **SWMU-6** DATE: 8-28-03

WEATHER: Sunny, clear, hot DRILLING CONTRACTOR: CH2M HILL

DRILLING METHOD AND EQUIPMENT USED : Hand Auger with stainless steel spoon and bowl.

WATER LEVELS : 0.5' bgs. START : 8-28-03 0840 END : 08-28-03 0845 LOGGER : I.Lynch

DEPTH BELOW SURFACE (FT)	INTERVAL (FT)	RECOVERY (IN)	#/TYPE	STANDARD PENETRATION TEST RESULTS 6"-6"-6" (N)	CORE DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION. OVM (ppm): Breathing Zone Above Hole
0.0						
	0.5	NA	NA	NA	0.0 to 0.5' WELL GRADED SAND (SW), blackish gray, wet, some silt, trace gravel, some organic material (roots)(peat), some shell fragments, sulfide odor, note: pieces in glass is soil.	soil sample with field duplicate collected. water table appears to be at 0.5 feet bgs.
0.5					END OF SOIL BORING @ 0.5 FEET bgs.	
1.0						
1.5						
2.0						
2.5						

Sampler Signature: Issac Lynch Date: 08/28/2003

CH2MHILL

PROJECT NUMBER	BORING NUMBER	
171119.FI.ZZ	NDW06 SS10	SHEET 1 OF 1

SURFACE SOIL LOG

PROJECT : NASD RI/FS INVESTIGATION LOCATION : **SWMU-6** DATE: 8-28-03

WEATHER: Sunny, light breeze, hot DRILLING CONTRACTOR: CH2M HILL

DRILLING METHOD AND EQUIPMENT USED : Hand Auger with stainless steel spoon and bowl.

WATER LEVELS : N/A START : 8-28-03 0845 END : 08-28-03 0850 LOGGER : I.Lynch

DEPTH BELOW SURFACE (FT)	INTERVAL (FT)	RECOVERY (IN)	#/TYPE	STANDARD PENETRATION TEST RESULTS 6"-6"-6"-6" (N)	CORE DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION. OVM (ppm): Breathing Zone Above Hole
0.0						
	0.5	NA	NA	NA	0.0 to 0.5' WELL GRADED SAND (SW), blackish gray, wet, fine sand, some silt, trace gravel, some organic material (roots)(peat), some shell fragments, sulfide odor, note: trace glass pieces in soil.	Sample collected
0.5					END OF SOIL BORING @ 0.5 FEET bgs.	
1.0						
1.5						
2.0						
2.5						

Sampler Signature: Issac Lynch Date: 08/28/2003

CH2MHILL

PROJECT NUMBER	BORING NUMBER	
171119.FI.ZZ	NDW06 SS11	SHEET 1 OF 1

SURFACE SOIL LOG

PROJECT : NASD RI/FS INVESTIGATION LOCATION : **SWMU-6** DATE: 8-28-03

WEATHER: Sunny, light breeze DRILLING CONTRACTOR: CH2M HILL

DRILLING METHOD AND EQUIPMENT USED : Hand Auger with stainless steel spoon and bowl.

WATER LEVELS : N/A START : 08-28-03 0850 END : 08-28-03 0853 LOGGER : I.Lynch

DEPTH BELOW SURFACE (FT)	INTERVAL (FT)	RECOVERY (IN)	#/TYPE	STANDARD PENETRATION TEST RESULTS 6"-6"-6"-6" (N)	CORE DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION. OVM (ppm): Breathing Zone Above Hole
0.0						
	0.5	NA	NA	NA	0.0 to 0.5' WELL GRADED SAND (SW), blackish gray, wet, fine sand, some silt, some shell fragments, some organic material (roots)(peat), trace gravel, sulfide odor, note: trace glass pieces in soil.	Sample collected
0.5					END OF SOIL BORING @ 0.5 FEET bgs.	
1.0						
1.5						
2.0						
2.5						

Sampler Signature: Issac Lynch Date: 08/28/2003

PROJECT NUMBER	BORING NUMBER	
171119.FI.ZZ	NDW06SS12	SHEET 1 OF 1

SURFACE SOIL LOG

PROJECT : NASD RI/FS INVESTIGATION LOCATION : **SWMU-6** DATE: 8-28-03

WEATHER: Sunny, light breeze, hot DRILLING CONTRACTOR: CH2M HILL

DRILLING METHOD AND EQUIPMENT USED : Hand Auger with stainless steel spoon and bowl.

WATER LEVELS : N/A START : 08-28-03 0853 END : 08-28-03 0855 LOGGER : I.Lynch

DEPTH BELOW SURFACE (FT)	INTERVAL (FT)	RECOVERY (IN)	#/TYPE	STANDARD PENETRATION TEST RESULTS 6"-6"-6"-6" (N)	CORE DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION. OVM (ppm): Breathing Zone Above Hole
0.0						
	0.5	NA	NA	NA	0.0 to 0.5' WELL GRADED SAND (SW), blackish gray, wet, fine sand, some silt, some shell fragments, some organic material (roots)(peat), trace gravel, sulfide odor, note: trace glass pieces in soil.	Sample collected
0.5					END OF SOIL BORING @ 0.5 FEET bgs.	
1.0						
1.5						
2.0						
2.5						

Sampler Signature: Issac Lynch Date: 08/28/2003

PROJECT NUMBER	BORING NUMBER	
171119.FI.ZZ	NDW06SS13	SHEET 1 OF 1

SURFACE SOIL LOG

PROJECT : NASD RI/FS INVESTIGATION LOCATION : **SWMU-6** DATE: 8-28-03

WEATHER: Sunny, hot DRILLING CONTRACTOR: CH2M HILL

DRILLING METHOD AND EQUIPMENT USED : Hand Auger with stainless steel spoon and bowl.

WATER LEVELS : N/A START : 08-28-03 0920 END : 08-28-03 0930 LOGGER : I.Lynch

DEPTH BELOW SURFACE (FT)	INTERVAL (FT)	RECOVERY (IN)	#/TYPE	STANDARD PENETRATION TEST RESULTS 6"-6"-6"-6" (N)	CORE DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION. OVM (ppm): Breathing Zone Above Hole
0.0						
	0.5	NA	NA	NA	0.0 to 0.5' WELL GRADED SAND (SW), light brownish gray, wet, fine sand, some silt, some shell fragments, some organic material (roots) (peat), trace gravel, sulfide odor, note: trace glass pieces in soil.	Sample collected.
0.5					END OF SOIL BORING @ 0.5 FEET bgs.	
1.0						
1.5						
2.0						
2.5						

Sampler Signature: Issac Lynch Date: 08/28/2003

CH2MHILL

PROJECT NUMBER	BORING NUMBER	
171119.FI.ZZ	NDW06 SS14	SHEET 1 OF 1

SURFACE SOIL LOG

PROJECT : NASD RI/FS INVESTIGATION LOCATION : **SWMU6** DATE: 8-28-03

WEATHER: Sunny, light breeze, hot DRILLING CONTRACTOR: CH2M HILL

DRILLING METHOD AND EQUIPMENT USED : Hand Auger with stainless steel spoon and bowl.

WATER LEVELS : N/A START : 08-28-03 0930 END : 08-28-03 0935 LOGGER : I.Lynch

DEPTH BELOW SURFACE (FT)	INTERVAL (FT)	RECOVERY (IN)	#/TYPE	STANDARD PENETRATION TEST RESULTS 6"-6"-6"-6" (N)	CORE DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION. OVM (ppm): Breathing Zone Above Hole
0.0						
	0.5	NA	NA	NA	0.0 to 0.5' WELL GRADED SAND (SW), gray, saturated, fine sand, some silt, some shell fragments, some organic material (roots)(peat), trace gravel, sulfide odor, note: trace glass pieces in soil.	Sample collected note: standing water at sample point.
0.5					END OF SOIL BORING @ 0.5 FEET bgs.	
1.0						
1.5						
2.0						
2.5						

Sampler Signature: Issac Lynch Date: 08/28/2003

CH2MHILL

PROJECT NUMBER	BORING NUMBER	
171119.FI.ZZ	NDW06SS15	SHEET 1 OF 1

SURFACE SOIL LOG

PROJECT : NASD RI/FS INVESTIGATION LOCATION : **SWMU-6** DATE: 8-28-03

WEATHER: Sunny, light breeze, hot DRILLING CONTRACTOR: CH2M HILL 9:45

DRILLING METHOD AND EQUIPMENT USED : Hand Auger with stainless steel spoon and bowl.

WATER LEVELS : N/A START : 08-28-03 0940 END : 08-28-03 0945 LOGGER : I.Lynch

DEPTH BELOW SURFACE (FT)	INTERVAL (FT)	RECOVERY (IN)	#/TYPE	STANDARD PENETRATION TEST RESULTS 6"-6"-6"-6" (N)	CORE DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION. OVM (ppm): Breathing Zone Above Hole
0.0						
	0.5	NA	NA	NA	0.0 to 0.5' WELL GRADED SAND (SW), gray, saturated, fine sand, some silt, some shell fragments, trace organic material (peat), sulfide odor, note: trace glass pieces in soil.	Sample collected note: standing water at sample point.
0.5					END OF SOIL BORING @ 0.5 FEET bgs.	
1.0						
1.5						
2.0						
2.5						

Sampler Signature: Issac Lynch Date: 08/28/2003

CH2MHILL

PROJECT NUMBER	BORING NUMBER	
171119.FI.ZZ	NDW06SS16	SHEET 1 OF 1

SURFACE SOIL LOG

PROJECT : NASD RI/FS INVESTIGATION LOCATION : **SWMU-6** DATE: 8-28-03

WEATHER: Sunny, light breeze, hot DRILLING CONTRACTOR: CH2M HILL

DRILLING METHOD AND EQUIPMENT USED : Hand Auger with stainless steel spoon and bowl.

WATER LEVELS : N/A START : 08-28-03 0950 END : 08-28-03 0955 LOGGER : I.Lynch

DEPTH BELOW SURFACE (FT)	INTERVAL (FT)	RECOVERY (IN)	#/TYPE	STANDARD PENETRATION TEST RESULTS 6"-6"-6"-6" (N)	CORE DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION. OVM (ppm): Breathing Zone Above Hole
0.0						
	0.5	NA	NA	NA	0.0 to 0.5' WELL GRADED SAND (SW), blackish gray, saturated, fine sand, some silt, some shell fragments, trace organic material (roots), sulfide odor, note: trace glass pieces in soil.	Sample collected note: standing water at sample point.
0.5	0.5				END OF SOIL BORING @ 0.5 FEET bgs.	
1.0						
1.5						
2.0						
2.5						

Sampler Signature: Issac Lynch Date: 08/28/2003

CH2MHILL

PROJECT NUMBER	BORING NUMBER	
171119.FI.ZZ	NDW06SS17	SHEET 1 OF 1

SURFACE SOIL LOG

PROJECT : NASD RI/FS INVESTIGATION LOCATION : **SWMU-6** DATE: 8-28-03

WEATHER: Sunny, hot DRILLING CONTRACTOR: CH2M HILL

DRILLING METHOD AND EQUIPMENT USED : Hand Auger with stainless steel spoon and bowl.

WATER LEVELS : N/A START : 08-28-03 1000 END : 08-28-03 1010 LOGGER : I.Lynch

DEPTH BELOW SURFACE (FT)	INTERVAL (FT)	RECOVERY (IN)	#/TYPE	STANDARD PENETRATION TEST RESULTS 6"-6"-6"-6" (N)	CORE DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION. OVM (ppm): Breathing Zone Above Hole
0.0						
	0.5	NA	NA	NA	0.0 to 0.5' WELL GRADED SAND (SW), grayish black, saturated, fine sand, some silt, some shell fragments, trace organic material (roots), sulfide odor, note: trace glass pieces in soil.	Sample collected note: standing water at sample point.
0.5					END OF SOIL BORING @ 0.5 FEET bgs.	
1.0						
1.5						
2.0						
2.5						

Sampler Signature: Issac Lynch Date: 08/28/2003

CH2MHILL

PROJECT NUMBER	BORING NUMBER	
171119.FI.ZZ	NDW06SS18	SHEET 1 OF 1

SURFACE SOIL LOG

PROJECT : NASD RI/FS INVESTIGATION LOCATION : **SWMU-6** DATE: 8-28-03

WEATHER: Sunny, light breeze, hot DRILLING CONTRACTOR: CH2M HILL

DRILLING METHOD AND EQUIPMENT USED : Hand Auger with stainless steel spoon and bowl.

WATER LEVELS : N/A START : 08-28-03 1010 END : 08-28-03 1015 LOGGER : I.Lynch

DEPTH BELOW SURFACE (FT)	INTERVAL (FT)	RECOVERY (IN)	#/TYPE	STANDARD PENETRATION TEST RESULTS 6"-6"-6"-6" (N)	CORE DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION. OVM (ppm): Breathing Zone Above Hole
0.0						
	0.5	NA	NA	NA	0.0 to 0.5' WELL GRADED SAND (SW), grayish black, saturated, fine sand, some silt, some shell fragments, trace organic material (roots) (peat), sulfide odor.	Sample collected note: standing water at sample point.
0.5					END OF SOIL BORING @ 0.5 FEET bgs.	
1.0						
1.5						
2.0						
2.5						

Sampler Signature: Issac Lynch Date: 08/28/2003

CH2MHILL

PROJECT NUMBER	BORING NUMBER	
171119.FI.ZZ	NDW06SS19	SHEET 1 OF 1

SURFACE SOIL LOG

PROJECT : NASD RI/FS INVESTIGATION LOCATION : **SWMU-6** DATE: 8-28-03

WEATHER: Sunny, light breeze, hot DRILLING CONTRACTOR: CH2M HILL

DRILLING METHOD AND EQUIPMENT USED : Hand Auger with stainless steel spoon and bowl.

WATER LEVELS : N/A START : 08-28-03 1020 END : 08-28-03 1025 LOGGER : I.Lynch

DEPTH BELOW SURFACE (FT)	INTERVAL (FT)	RECOVERY (IN)	#/TYPE	STANDARD PENETRATION TEST RESULTS 6"-6"-6"-6" (N)	CORE DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION. OVM (ppm): Breathing Zone Above Hole
0.0						
	0.5	NA	NA	NA	0.0 to 0.5' WELL GRADED SAND (SW), grayish black, saturated, fine sand, some silt, some shell fragments, trace organic material (roots) (peat), sulfide odor.	Sample collected note: standing water at sample point.
0.5					END OF SOIL BORING @ 0.5 FEET bgs.	
1.0						
1.5						
2.0						
2.5						

Sampler Signature: Issac Lynch Date: 08/28/2003

CH2MHILL

PROJECT NUMBER	BORING NUMBER	
171119.FI.ZZ	NDW06SS20	SHEET 1 OF 1

SURFACE SOIL LOG

PROJECT : NASD RI/FS INVESTIGATION LOCATION : **SWMU-6** DATE: 8-28-03

WEATHER: Sunny, light breeze, hot DRILLING CONTRACTOR: CH2M HILL

DRILLING METHOD AND EQUIPMENT USED : Hand Auger with stainless steel spoon and bowl.

WATER LEVELS : N/A START : 08-28-03 1025 END : 08-28-03 1030 LOGGER : I.Lynch

DEPTH BELOW SURFACE (FT)	INTERVAL (FT)	RECOVERY (IN)	#/TYPE	STANDARD PENETRATION TEST RESULTS 6"-6"-6"-6" (N)	CORE DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION. OVM (ppm): Breathing Zone Above Hole
0.0						
	0.5	NA	NA	NA	0.0 to 0.5' WELL GRADED SAND (SW), gray, wet, fine sand, some silt, some shell fragments, trace organic material (roots)(peat), sulfide odor.	Sample collected
0.5					END OF SOIL BORING @ 0.5 FEET bgs.	
1.0						
1.5						
2.0						
2.5						

Sampler Signature: Issac Lynch Date: 08/28/2003

CH2MHILL

PROJECT NUMBER	BORING NUMBER	
171119.FI.ZZ	NDW06SS21	SHEET 1 OF 1

SURFACE SOIL LOG

PROJECT : NASD RI/FS INVESTIGATION LOCATION : **SWMU-6** DATE: 8-28-03

WEATHER: Sunny, light breeze, hot DRILLING CONTRACTOR: CH2M HILL

DRILLING METHOD AND EQUIPMENT USED : Hand Auger with stainless steel spoon and bowl.

WATER LEVELS : N/A START : 08-28-03 1040 END : 08-28-03 1045 LOGGER : I.Lynch

DEPTH BELOW SURFACE (FT)	INTERVAL (FT)	RECOVERY (IN)	#/TYPE	STANDARD PENETRATION TEST RESULTS 6"-6"-6"-6" (N)	CORE DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION. OVM (ppm): Breathing Zone Above Hole
0.0						
	0.5	NA	NA	NA	0.0 to 0.5' WELL GRADED SAND (SW), black, wet, fine sand, some silt, some shell fragments, trace organic material (roots)(peat), sulfide odor.	Sample collected
0.5					END OF SOIL BORING @ 0.5 FEET bgs.	
1.0						
1.5						
2.0						
2.5						

Sampler Signature: Issac Lynch Date: 08/28/2003

CH2MHILL

PROJECT NUMBER	BORING NUMBER	
171119.FI.ZZ	NDW06SS22	SHEET 1 OF 1

SURFACE SOIL LOG

PROJECT : NASD RI/FS INVESTIGATION LOCATION : **SWMU-6** DATE: 8-28-03

WEATHER: Sunny, light breeze, hot DRILLING CONTRACTOR: CH2M HILL

DRILLING METHOD AND EQUIPMENT USED : Hand Auger with stainless steel spoon and bowl.

WATER LEVELS : N/A START : 08-28-03 1030 END : 08-28-03 1035 LOGGER : I.Lynch

DEPTH BELOW SURFACE (FT)	INTERVAL (FT)	RECOVERY (IN)	#/TYPE	STANDARD PENETRATION TEST RESULTS 6"-6"-6"-6" (N)	CORE DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION. OVM (ppm): Breathing Zone Above Hole
0.0						
	0.5	NA	NA	NA	0.0 to 0.5' WELL GRADED SAND (SW), gray, wet, fine sand, some silt, some shell fragments, trace organic material (roots)(peat), sulfide odor.	Sample collected
0.5					END OF SOIL BORING @ 0.5 FEET bgs.	
1.0						
1.5						
2.0						
2.5						

Sampler Signature: Issac Lynch Date: 08/28/2003

CH2MHILL

PROJECT NUMBER	BORING NUMBER	
171119.FI.ZZ	NDW06SS23	SHEET 1 OF 1

SURFACE SOIL LOG

PROJECT : NASD RI/FS INVESTIGATION LOCATION : **SWMU-6** DATE: 8-28-03

WEATHER: Sunny, light breeze, hot DRILLING CONTRACTOR: CH2M HILL

DRILLING METHOD AND EQUIPMENT USED : Hand Auger with stainless steel spoon and bowl.

WATER LEVELS : N/A START : 08-28-03 1045 END : 08-28-03 1050 LOGGER : I.Lynch

DEPTH BELOW SURFACE (FT)	INTERVAL (FT)	RECOVERY (IN)	#/TYPE	STANDARD PENETRATION TEST RESULTS 6"-6"-6"-6" (N)	CORE DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION. OVM (ppm): Breathing Zone Above Hole
0.0						
	0.5	NA	NA	NA	0.0 to 0.5' WELL GRADED SAND (SW), brownish black, wet, fine sand, some silt, some shell fragments, trace organic material (roots)(peat), sulfide odor, note: trace pieces of glass in soil.	Sample collected Also collected MS/DS
0.5					END OF SOIL BORING @ 0.5 FEET bgs.	
1.0						
1.5						
2.0						
2.5						

Sampler Signature: Issac Lynch Date: 08/28/2003

PROJECT NUMBER	WELL NUMBER		
171119.FI.ZZ	NDW06MW05	SHEET 1	OF 1

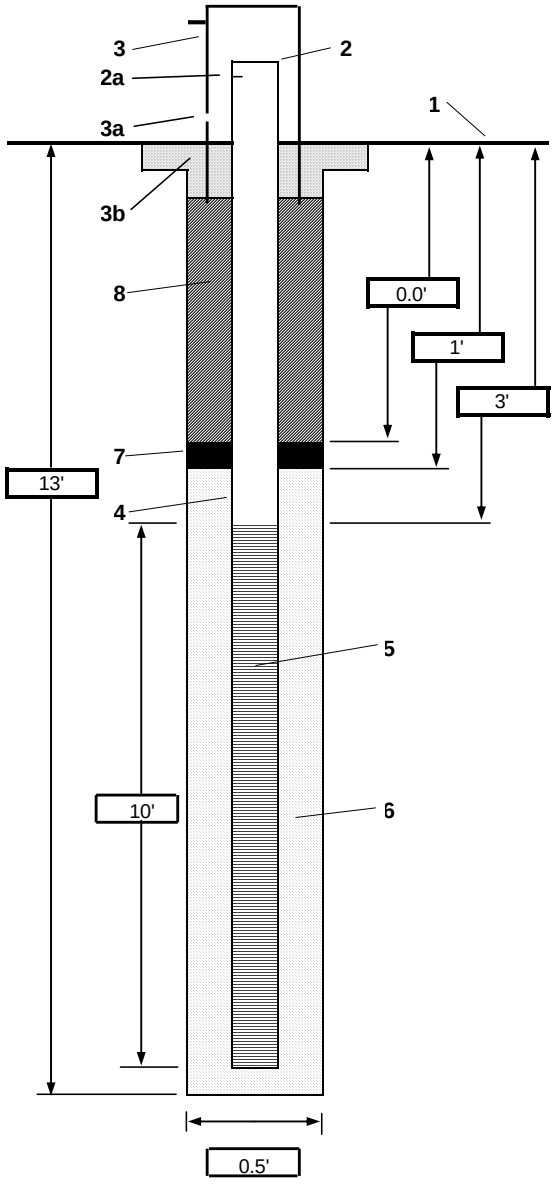
WELL COMPLETION DIAGRAM

PROJECT : **NASD, VIEQUES, RI/FS INVESTIGATION** LOCATION : **SWMU 6**

DRILLING CONTRACTOR : **Environmental Drilling Service (EDS), Orlando, FL**

DRILLING METHOD AND EQUIPMENT USED : **4" stainless steel hand auger with 6" PVC pipe driven down to 13.0'**

WATER LEVELS : **0.75' bgs** START : **8/23/03 @ 0845** END: **8/23/03 @ 0930** LOGGER : **E. ISERN**



1- Ground elevation at well: TBD

2- Top of casing elevation: 1.995 ft amsl
a) vent hole?: none

3- Wellhead protection cover type: above ground steel casing
a) weep hole?: none
b) concrete pad dimensions: 3' x 3'

4- Dia./type of well casing: 2" / Sch 40 PVC

5- Type/slot size of screen: Sch 40 PVC / 0.010" slot size

6- Type screen filter: #1 Sand
a) Quantity used: 3.5 BAGS

7- Type of seal: Bentonite Slurry
a) Quantity used: 1/2 Bag

8- Grout
a) Grout mix used: NONE
b) Method of placement: NA
c) Vol. of well casing grout: NA

Development method: Peristaltic/Whale pump with TFE tubing

Development time: 2.5 hours

Estimated purge volume: 98 gals

Comments

PROJECT NUMBER	WELL NUMBER		
17119.FI.ZZ	NDW06MW06	SHEET 1	OF 1

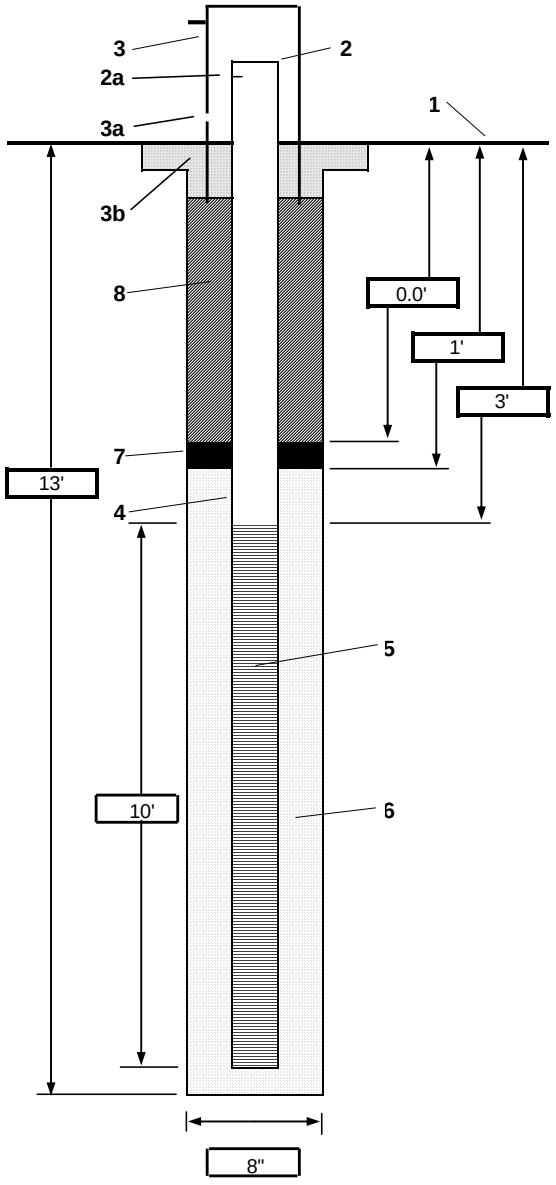
WELL COMPLETION DIAGRAM

PROJECT : **NASD, VIEQUES, RI/FS INVESTIGATION** LOCATION : **SWMU 6**

DRILLING CONTRACTOR : **Environmental Drilling Service (EDS), Orlando, FL**

DRILLING METHOD AND EQUIPMENT USED : **Hollow Stem Auger, 4.25" ID, 2" split-spoon with 140 lb hammer**

WATER LEVELS : **2' bgs** START : **8/20/03 @ 1015** END: **8/20/03 @ 1050** LOGGER : **S.Martin/E.Isern**



1-	Ground elevation at well	TBD
2-	Top of casing elevation	2.188 ft amsl
	a) vent hole?	none
3-	Wellhead protection cover type	above ground protective casing
	a) weep hole?	none
	b) concrete pad dimensions	3' X 3'
4-	Dia./type of well casing	2" / Sch 40 PVC
5-	Type/slot size of screen	Sch 40 PVC / 0.010" slot size
6-	Type screen filter	#1 Sand
	a) Quantity used	7 Bags
7-	Type of seal	Bentonite Slurry
	a) Quantity used	1/2 Bag
8-	Grout	
	a) Grout mix used	NONE
	b) Method of placement	NA
	c) Vol. of well casing grout	NA
	Development method	Whale pump with TFE tubing
	Development time	45 minutes
	Estimated purge volume	87 gals

Comments

PROJECT NUMBER	WELL NUMBER		
171119.FI.ZZ	NDW06MW07	SHEET 1	OF 1

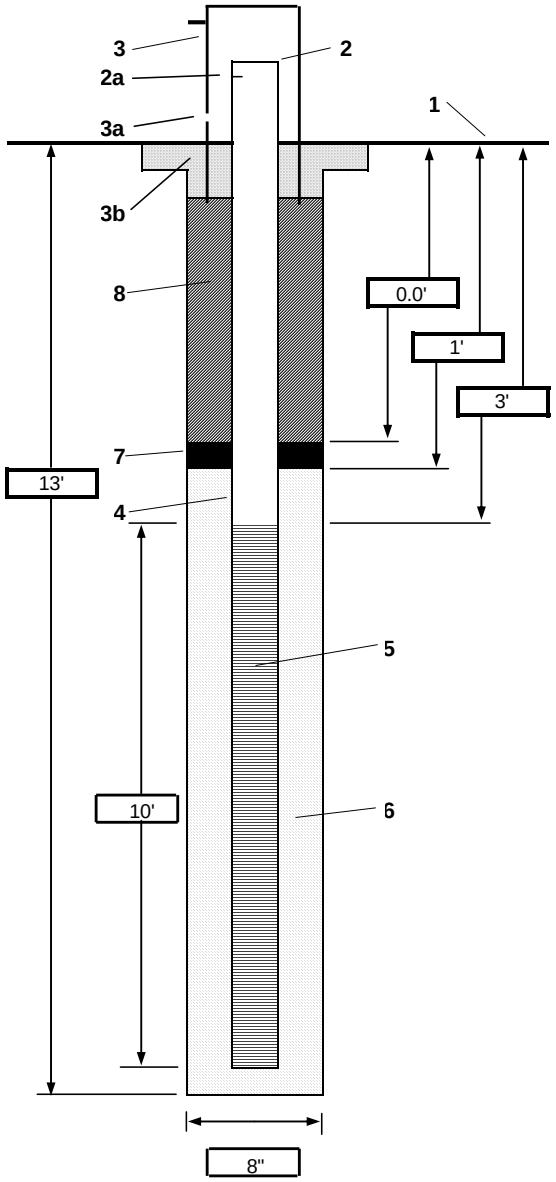
WELL COMPLETION DIAGRAM

PROJECT : **NASD, VIEQUES, RI/FS INVESTIGATION** LOCATION : **SWMU 6**

DRILLING CONTRACTOR : **Environmental Drilling Service (EDS), Orlando, FL**

DRILLING METHOD AND EQUIPMENT USED : **Hollow Stem Auger, 4.25" ID, 2" split-spoon with 140 lb hammer**

WATER LEVELS : **2' bgs** START : **8/20/03 @ 0835** END : **8/20/03 @ 0905** LOGGER : **S.Martin/E.Isern**



1- Ground elevation at well: TBD

2- Top of casing elevation: 1.217 ft amsl
a) vent hole? none

3- Wellhead protection cover type: above ground protective casing
a) weep hole? none
b) concrete pad dimensions: 3' X 3'

4- Dia./type of well casing: 2" / Sch 40 PVC

5- Type/slot size of screen: Sch 40 PVC / 0.010" slot size

6- Type screen filter: #1 Silica Sand
a) Quantity used: 5 Bags

7- Type of seal: Bentonite Slurry
a) Quantity used: 1/2 Bag

8- Grout
a) Grout mix used: NONE
b) Method of placement: NA
c) Vol. of well casing grout: NA

Development method: Peristatic pump with TFE tubing

Development time: 45 minutes

Estimated purge volume: 35 gals

Comments

PROJECT NUMBER	WELL NUMBER		
171119.FI.ZZ	NDW06MW08	SHEET 1	OF 1

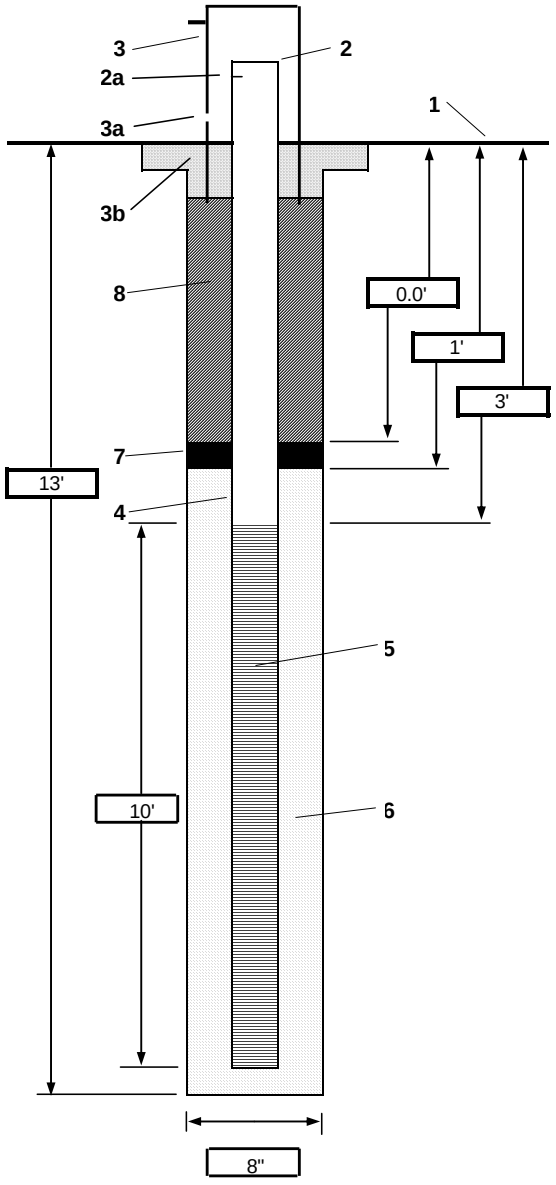
WELL COMPLETION DIAGRAM

PROJECT : **NASD, VIEQUES, RI/FS INVESTIGATION** LOCATION : **SWMU 6**

DRILLING CONTRACTOR : **Environmental Drilling Service (EDS), Orlando, FL**

DRILLING METHOD AND EQUIPMENT USED : **Hollow Stem Auger, 4.25" ID, 2" split-spoon with 140 lb hammer**

WATER LEVELS : **2' bgs** START : **8/19/03 @ 1600** END : **8/19/03 @ 1645** LOGGER : **E. ISERN**



1-	Ground elevation at well	TBD
2-	Top of casing elevation	0.965 ft amsl
	a) vent hole?	none
3-	Wellhead protection cover type	above ground protective casing
	a) weep hole?	NONE
	b) concrete pad dimensions	3' X 3'
4-	Dia./type of well casing	2" / Sch 40 PVC
5-	Type/slot size of screen	Sch 40 PVC / 0.010" slot size
6-	Type screen filter	Silica Sand 20 - 30 and 30- 65
	a) Quantity used	250 lbs and 50 lbs, respectively
7-	Type of seal	Bentonite Slurry
	a) Quantity used	10 lbs
8-	Grout	
	a) Grout mix used	NONE
	b) Method of placement	NA
	c) Vol. of well casing grout	NA
	Development method	TFE disposable bailer
	Development time	2 hours
	Estimated purge volume	35 gals

Comments

PROJECT NUMBER	WELL NUMBER	
171119.F1.ZZ	NDW06MW05	SHEET 1 OF 1

WELL DEVELOPMENT LOG

PROJECT : **NASD, VIEQUES, RI/FS INVESTIGATION** LOCATION : **SWMU 06**

DEVELOPMENT CONTRACTOR : **CH2M HILL**

DEVELOPMENT METHOD AND EQUIPMENT USED : **PERISTALTIC PUMP/ WHALE PUMP/BAILER**

START WATER LEVELS : **3.0 FT** START : **8/28/03 @ 1200** END : **8/28/03 @ 1435** LOGGER : **I. Lynch**

MAXIMUM DRAWDOWN DURING PUMPING: **NA**

RANGE AND AVERAGE DISCHARGE RATE: **850 mL/min = 0.22 gpm (Peristaltic Pump), 1.5 gpm (Whale Pump)**

TOTAL QUANTITY OF WATER DISCHARGE **98 Gallons**

DISPOSITION OF DISCHARGE WATER: **Drum**

Time	Water Volume Discharged (gal)	Water Level (ft BTOC)	Turbidity (NTU)	Temperature (°C)	pH	Conductivity (µmhos/cm)	Remarks (color, odor, sheen, sediment, etc.)
1200	Begin Pumping						Dark gray, H2S odor, heavy fine silts
1220	Stopped Pumping and Surged with Bailer						
1300	10	Due to high sediment, the well was bailed to get the most of the fines out					
1305							Start Peristaltic Pump
1330							Switch to Whale Pump, surge well
1400	45			31.27	6.53	67,740	Low turbidity
1430	98			32.73	6.57	61,426	Low turbidity
							Clear well water

PROJECT NUMBER	WELL NUMBER	
171119.F1.ZZ	NDW06MW06	SHEET 1 OF 1

WELL DEVELOPMENT LOG

PROJECT : **NASD, VIEQUES, RI/FS INVESTIGATION** LOCATION : **SWMU 06**

DEVELOPMENT CONTRACTOR : **CH2M HILL**

DEVELOPMENT METHOD AND EQUIPMENT USED : **WHALE PUMP/BAILER**

START WATER LEVELS : **3.52 FT** START : **8/28/03 @ 1130** END : **8/28/03 @ 1315** LOGGER : **I. Lynch**

MAXIMUM DRAWDOWN DURING PUMPING: **NA**

RANGE AND AVERAGE DISCHARGE RATE: **1.2 gpm**

TOTAL QUANTITY OF WATER DISCHARGE **87 Gallons**

DISPOSITION OF DISCHARGE WATER: **Drum**

Time	Water Volume Discharged (gal)	Water Level (ft BTOC)	Turbidity (NTU)	Temperature (°C)	pH	Conductivity (µmhos/cm)	Remarks (color, odor, sheen, sediment, etc.)
1240	48			29.68	6.51	66,941	Low turbidity
1300	Stopped Pumping and Surged with Bailer						
1306	79			29.45	6.49	67,475	Low turbidity
1310	Stopped Pumping and Surged with Bailer						
1312	87			29.36	6.5	67,395	Low turbidity
							Clear well water

CH2MHILL

PROJECT NUMBER	WELL NUMBER	
171119.F1.ZZ	NDW06MW07	SHEET 1 OF 1

WELL DEVELOPMENT LOG

PROJECT : **NASD, VIEQUES, RI/FS INVESTIGATION** LOCATION : **SWMU 06**

DEVELOPMENT CONTRACTOR : **CH2M HILL**

DEVELOPMENT METHOD AND EQUIPMENT USED : **PERISTALTIC PUMP/ BAILER**

START WATER LEVELS : **2.05 FT** START : **8/24/03 @ 1435** END : **8/24/03 @ 1520** LOGGER : **E. ISERN**

MAXIMUM DRAWDOWN DURING PUMPING: **NA**

RANGE AND AVERAGE DISCHARGE RATE: **850 mL/min = 0.22 gpm**

TOTAL QUANTITY OF WATER DISCHARGE **35 Gallons**

DISPOSITION OF DISCHARGE WATER: **Drum**

Time	Water Volume Discharged (gal)	Water Level (ft BTOC)	Turbidity (NTU)	Temperature (°C)	pH	Conductivity (µmhos/cm)	Remarks (color, odor, sheen, sediment, etc.)
1435	Begin Pumping Surge Three times with Bailer						
1445	Pump Again						
1455	25			31.32	6.34	71,015	Strong Hydrogen Sulfide smell
1505	30			31.3	6.38	70,714	Hydrogen Sulfide smell
1515	35			32.29	6.38	70,943	Hydrogen Sulfide smell, color is light yellowish green

PROJECT NUMBER	WELL NUMBER	
171119.F1.ZZ	NDW06MW08	SHEET 1 OF 1

WELL DEVELOPMENT LOG

PROJECT : **NASD, VIEQUES, RI/FS INVESTIGATION** LOCATION : **SWMU 06**

DEVELOPMENT CONTRACTOR : **CH2M HILL**

DEVELOPMENT METHOD AND EQUIPMENT USED : **BAILER used on 8/21/03; Whale pump used on 8/28/03**

START WATER LEVELS : **2.05 FT** START : **8/21/03 @ 1510** END : **8/28/03 @ 1530** LOGGER : **R. Gorsira, M. Brown, I. Lynch**

MAXIMUM DRAWDOWN DURING PUMPING:**3.45'**

RANGE AND AVERAGE DISCHARGE RATE: **NA**

TOTAL QUANTITY OF WATER DISCHARGED: **74 gallons**

DISPOSITION OF DISCHARGE WATER: **Drum**

Time	Water Volume Discharged (gal)	Water Level (ft BTOC)	Turbidity (NTU)	Temperature (°C)	pH	Conductivity (µmhos/cm)	Remarks (color, odor, sheen, sediment, etc.)
8/21/03 Well Development:							
1535	9		na	31.33	6.57	46,240	highly turbid, gray sand color
1600	16		na	31.27	6.4	52,439	hydrogen sulfide odor
1620	22		823	30.7	6.38	55,630	
1635	28	3.45	1000	30.62	6.39	60,629	
1710	34		1000	30.75	6.27	65,135	
	Stopped bailing due to heavy rain at 17:15						
8/28/03 Well Development:							
1500 Whale pump on.							
1515	25		low	32.32	6.53	56,836	
1530	40		low	31.94	6.49	57,594	
							water very clear.

GROUNDWATER SAMPLING DATA SHEET

CH2M HILL, INC.

Project Number: **171119.FI.ZZ**

Client: **LANTDIV**
Location: **SWMU 6**
Event: **NASD, VIEQUES, RI/FS INVESTIGATION**
Date: **09/05/2003**
Weather: **Sunny, hot, low humidity**

Well ID: **NDW06MW01**
Sample ID: **NDW06 GW01-R01**
MS/MSD YES / **NO**
Sample Team: **T. Casey**
A. Awwad

Total Depth: **16.64** FT.(BTOC)
Depth to water: (-)**3.85** FT.(BTOC)
Water Column: **12.79** FT.
(x) **0.163** GAL/FT.
Well Volume: **2.08** GAL.
Total Purge Volume: **2.78** GAL.

Measuring Device: **Water Level Indicator**
Date and Time: **9-5-03 @ 0939**

WELL DIAMETER
[(2" DIA.= .163 GAL/FT.) (4" DIA. = .653 GAL/FT.)]
(1" DIA.= .041 GAL/FT.) (1 1/4 " DIA.= .064 GAL/FT.)

Purge Device: **Peristaltic Pump/Bladder Pump (for VOC sample collection only\)**
Sample Time **10:05**
Sample Appearance **Yellow, no sediment, strong hydrogen sulfide odor**
Flow rate: 462 mL/min = 0.12 gal/min

FIELD PARAMETERS

Time	Purged Vol. (gals)	pH	Cond. µmhos/cm	Temp., °C	DO mg/L	ORP	Turbidity	Depth to Water, FT BTOC	Color / Odor / Comments
939	0.26	6.46	91,151	31.15	0.00	-285.7	18.4	3.85	Yellow/Strong H_2S
945	0.98	6.49	91,125	31.06	0.00	-305.3	11.5	3.89	Yellow/Strong H_2S
950	1.58	6.48	91,262	31.04	0.00	-302.8	9.27	3.89	Yellow/Strong H_2S
955	2.18	6.46	90,913	30.91	0.00	-301.2	5.16	3.89	Yellow/Strong H_2S
1000	2.78	6.44	90,635	30.94	0.00	-299.9	3.43	3.92	Yellow/Strong H_2S
Analysis: Laboratory Analytical Parameters									
SO_4	Total Metals		VOC						
NO_3	Dissolved Metals		EXP						
NO_2	PERC		SVOC						
PO_4	ALK		PEST						

Signed by: **T. Casey**

09/05/2003 @ 1045
Date and Time

GROUNDWATER SAMPLING DATA SHEET

CH2M HILL, INC.

Project Number: **171119.FI.ZZ**

Client: **LANTDIV**
Location: **SWMU 6**
Event: **NASD, VIEQUES, RI/FS INVESTIGATION**
Date: **09/05/2003**
Weather: **Sunny, Hot**

Well ID: **NDW06MWO2**
Sample ID: **NDWO6GW02**
MS/MSD YES / **NO**
Sample Team: **E. Isern**
S. Salazar

Total Depth: **14.3** FT.(BTOC)
Depth to water: (-)**5.03** FT.(BTOC)
Water Column: **9.27** FT.
(x)**0.163** GAL/FT.
Well Volume: **1.51** GAL.
Total Purge Volume: **4.0** GAL.

Measuring Device: **Water Level Indicator**
Date and Time: **09/05/2003 @1130**

WELL DIAMETER
[(2" DIA.= .163 GAL/FT.) (4" DIA. = .653 GAL/FT.)]
(1" DIA.= .041 GAL/FT.) (1 1/4 " DIA.= .064 GAL/FT.)

Purge Device: **Peristaltic Pump/Bladder pump(VOC sample collection only)**
Sample Time **12:00**
Sample Appearance **Clear in Tubing, Turns charcoal color in bucket**
Flow rate: 500mL/min = 0.14gal/min

FIELD PARAMETERS

Time	Purged Vol. (gals)	pH	Cond. µmhos/cm	Temp., °C	DO	ORP	Turbidity	Depth to Water, FT BTOC	Color / Odor / Comments
1130	0.00	6.94	74,600	30.33	0.54	-107.9	6.85	5.03	Clear/Slight H2S odor
1135	0.75	6.84	74,030	29.66	0.24	-114.6	4.32	4.98	Clear/Slight H2S odor
1140	1.50	6.78	73,320	29.56	0.57	-182.9	3.17	4.96	Clear/Slight H2S odor
1145	2.25	6.79	72,860	29.48	1.36	-221.2	2.33	4.95	Clear/Slight H2S odor
1150	3.25	6.84	72,340	29.47	2.62	-270.3	1.97	4.95	Clear/Slight H2S odor
1155	4.00	6.84	71,950	29.53	3.20	-304.1	1.76	4.95	Clear/Slight H2S odor
Analysis: Laboratory Analytical Parameters									
SO_4	Total Metals		VOC						
NO_3	Dissolved Metals		EXP						
NO_2	PERC		SVOC						
PO_4	ALK		PEST						

Signed by: **T. Casey**

09/05/2003 @ 1200
Date and Time

GROUNDWATER SAMPLING DATA SHEET

CH2M HILL, INC.

Project Number: **171119.FI.ZZ**

Client: **LANTDIV**
Location: **SWMU 6**
Event: **NASD, VIEQUES, RI/FS INVESTIGATION**
Date: **09/05/2003**
Weather: **Sunny, Hot**

Well ID: **NDW06MW03**
Sample ID: **NDW06GW03**
MS/MSD YES / **NO**
Sample Team: **E. Isern**
S. Salazar

Total Depth (Approx) **14** FT.(BTOC)
Depth to water: (-)**3.91** FT.(BTOC)
Water Column: **10.99** FT.
(x)**0.163** GAL/FT.
Well Volume: **1.8** GAL.
Total Purge Volume: **2.0** GAL.

Measuring Device: **Water level Indicator**
Date and Time: **09/05/2003 @1310**

WELL DIAMETER
[(2" DIA.= .163 GAL/FT.) (4" DIA. = .653 GAL/FT.)]
(1" DIA.= .041 GAL/FT.) (1 1/4 " DIA.= .064 GAL/FT.)

Purge Device: **Peristaltic Pump/Bladder pump(VOC sample collection only)**
Sample Time **13:30**
Sample Appearance **Clear, hydrogen sulfur odor**
Flow Rate: 500mL/min = 0.14gal/min

FIELD PARAMETERS

Time	Purged Vol. (gals)	pH	Cond. µmhos/cm	Temp., °C	DO	ORP	Turbidity	Depth to Water, FT BTOC	Color / Odor / Comments
1310	0	6.04	62,420	30.72	3.27	-166.7	1.29	3.91	Slight H_2S odor
1315	0.75	6.58	63,800	30.58	5.53	-221.7	1.19	3.98	Slight H_2S odor
1320	1.35	6.53	66,300	30.45	6.55	-258.4	1.32	3.97	Slight H_2S odor
1325	2.0	6.49	65,760	30.41	6.71	-318.8	1.16	3.95	Slight H_2S odor
Analysis: Laboratory Analytical Parameters									
SO_4	Total Metals		VOC						
NO_3	Dissolved Metals		EXP						
NO_2	PERC		SVOC						
PO_4	ALK		PEST						

Signed by: **T. Casey**

09/05/2003 @ 1330
Date and Time

GROUNDWATER SAMPLING DATA SHEET

CH2M HILL, INC.

Project Number: **171119.FI.ZZ**

Client: **LANTDIV**
Location: **SWMU 6**
Event: **NASD, VIEQUES, RI/FS INVESTIGATION**
Date: **09/07/2003**
Weather: **Sunny, Wind-East at 5mph**
Temp 93 °F

Well ID: **NDW06MW04**
Sample ID: **NDWO6GWO4**
MS/MSD YES / **NO**
Sample Team: **E. Isern**
F. Sengiali

Total Depth: **13.35** FT.(BTOC)
Depth to water: (-)**3.64** FT.(BTOC)
Water Column: **9.71** FT.
(x)**0.163** GAL/FT.
Well Volume: **1.58** GAL.
Total Purge Volume: **3.0** GAL.

Measuring Device: **Water level Indicator**
Date and Time: **09/08/2003 @1105**

WELL DIAMETER
[(2" DIA.= .163 GAL/FT.) (4" DIA. = .653 GAL/FT.)]
(1" DIA.= .041 GAL/FT.) (1 1/4 " DIA.= .064 GAL/FT.)

Purge Device: **Peristaltic Pump/Bladder Pump (for VOC sample collection only\)**
Sample Time **11:40**
Sample Appearance **Clear, hydrogen sulfur odor**
Flow rate: 500mL/min = 0.14gal/min

FIELD PARAMETERS

Time	Purged Vol. (gals)	pH	Cond. µmhos/cm	Temp., °C	DO	ORP	Turbidity	Depth to Water, FT BTOC	Color / Odor / Comments
1106	0.0	6.59	80,200	30.84	8.76	-288.1	7.79	3.82	Clear, H_2S Odor
1111	0.5	6.49	79,880	30.30	0.00	-294.1	2.73	3.82	Clear, H_2S Odor
1120	1.5	6.49	79,460	30.26	0.00	-290.7	1.23	3.8	Clear, H_2S Odor
1125	2.0	6.49	79,380	30.24	0.00	-291.4	1.25	3.81	Clear, H_2S Odor
1130	2.5	6.47	79,340	30.25	0.00	-292.0	0.95	3.81	Clear, H_2S Odor
1135	3.0	6.46	79,350	30.25	0.00	-292.6	0.88	3.83	Clear, H_2S Odor

Analysis: Laboratory Analytical Parameters			
SO_4	Total Metals		VOC
NO_3	Dissolved Metals		EXP
NO_2	PERC		SVOC
PO_4	ALK		PEST

Signed by: **T. Casey**

09/08/2003 @ 1140
Date and Time

GROUNDWATER SAMPLING DATA SHEET

CH2M HILL, INC.

Project Number: **171119.FI.ZZ**

Client: **LANTDIV**
Location: **SWMU 6**
Event: **NASD, VIEQUES, RI/FS INVESTIGATION**
Date: **09/05/2003**
Weather: **Sunny, hot**

Well ID: **NDW06MWO5**
Sample ID: **NDW06GWO5-RO1**
MS/MSD YES / **NO** **Field Dup. NDWO6FD01**
Sample Team: **E. Isern**
S. Salazar

Total Depth: **14.93** FT.(BTOC)
Depth to water: (-)**3.61** FT.(BTOC)
Water Column: **11.32** FT.
(x)**0.163** GAL/FT.
Well Volume: **1.85** GAL.
Total Purge Volume: **3.9** GAL.

Measuring Device: **Water Level Indicator**
Date and Time: **09/05/2003 @ 0954**

WELL DIAMETER
[(2" DIA.= .163 GAL/FT.) (4" DIA. = .653 GAL/FT.)]
(1" DIA.= .041 GAL/FT.) (1 1/4 " DIA.= .064 GAL/FT.)

Purge Device: **Peristaltic Pump/Bladder Pump (for VOC sample collection only\)**
Sample Time **10:25**
Sample Appearance **Clear in tubing, turns charcoal in the bucket**
Flow rate: 500mL/min = 0.14gal/min

FIELD PARAMETERS

Time	Purged Vol. (gals)	pH	Cond. µmhos/cm	Temp., °C	DO	ORP	Turbidity	Depth to Water, FT BTOC	Color / Odor / Comments
954	0.00	6.52	60,740	29.96	7.50	-168.4	23.2	3.61	Clear/Slight H2S odor
1000	1.00	6.43	60,650	29.89	15.50	-200.4	12.9	3.61	Clear/Slight H2S odor
1005	1.75	6.38	60,750	29.79	18.05	-222.2	8.05	3.62	Clear/Slight H2S odor
1010	2.25	6.35	60,790	29.81	18.50	-239.9	6.04	3.62	Clear/Slight H2S odor
1015	3.25	6.34	60,740	29.73	11.98	-260.9	5.15	3.62	Clear/Slight H2S odor
1020	3.90	6.35	60,770	29.74	5.79	-271.2	3.73	3.62	Clear/Slight H2S odor
Analysis: Laboratory Analytical Parameters									
SO_4	Total Metals		VOC						
NO_3	Dissolved Metals		EXP						
NO_2	PERC		SVOC						
PO_4	ALK		PEST						

Signed by: **T. Casey**

09/05/2003 @ 1025
Date and Time

GROUNDWATER SAMPLING DATA SHEET

CH2M HILL, INC.

Project Number: **17119.FI.ZZ**

Client: **LANTDIV**
Location: **SWMU 6**
Event: **NASD, VIEQUES, RI/FS INVESTIGATION**
Date: **09/05/2003**
Weather: **Sunny, HOT!**

Well ID: **NDW06MW06**
Sample ID: **NDW06GWO6-RO1**
MS/MSD YES / **NO**
Sample Team: **T. Casey**
A. Awwad

Total Depth: **15.9** FT.(BTOC)
Depth to water: (-)**3.6** FT.(BTOC)
Water Column: **12.3** FT.
(x) **0.163** GAL/FT.
Well Volume: **2.00** GAL.
Total Purge Volume: **2.79** GAL.

Measuring Device: **Water Level Indicator**
Date and Time: **09/05/2003 @ 1304**

WELL DIAMETER
[(2" DIA.= .163 GAL/FT.) (4" DIA. = .653 GAL/FT.)]
(1" DIA.= .041 GAL/FT.) (1 1/4 " DIA.= .064 GAL/FT.)

Purge Device: **Peristaltic Pump/Bladder Pump (for VOC sample collection only\)**
Sample Time **13:30**
Sample Appearance **Yellow, no sediment, strong H_2S odor**

Flow Rate: 455mL/min = 0.12gal/min

FIELD PARAMETERS

Time	Purged Vol. (gals)	pH	Cond. µmhos/cm	Temp., °C	DO	ORP	Turbidity	Depth to Water, FT BTOC	Color / Odor / Comments
1304	0.39	6.44	78,731	30.57	0.00	-295.0	16.1	4.06	Yellow, strong H_2S odor
1309	0.99	6.42	77,695	30.46	0.00	-295.0	10.7	4.06	Yellow, strong H_2S odor
1314	1.59	6.41	77,505	30.53	0.00	-291.7	6.75	4.08	Yellow, strong H_2S odor
1319	2.19	6.40	77,625	30.49	0.00	-292.0	4.56	4.11	Yellow, strong H_2S odor
1325	2.79	6.39	77,212	30.42	0.00	-294.6	3.63	4.11	Yellow, strong H_2S odor
Analysis: Laboratory Analytical Parameters									
SO_4	Total Metals		VOC						
NO_3	Dissolved Metals		EXP						
NO_2	PERC		SVOC						
PO_4	ALK		PEST						

Signed by: **T. Casey**

9/5/03 @ 1400
Date and Time

GROUNDWATER SAMPLING DATA SHEET

CH2M HILL, INC.

Project Number: **171119.FI.ZZ**

Client: **LANTDIV**
Location: **SWMU 6**
Event: **NASD, VIEQUES, RI/FS INVESTIGATION**
Date: **09/07/2003**
Weather: **Sunny**

Well ID: **NDW06MW07**
Sample ID: **NDW06GW07**
MS/MSD YES / **NO**
Sample Team: **T. Casey**
S. Salazar

Total Depth: **14.84** FT.(BTOC)
Depth to water: (-)**2.80** FT.(BTOC)
Water Column: **12.14** FT.
(x)**0.163** GAL/FT.
Well Volume: **1.98** GAL.
Total Purge Volume: **3.89** GAL.

Measuring Device: **Water Level Indicator**
Date and Time: **09/07/2003 @ 1100**

WELL DIAMETER
[(2" DIA.= .163 GAL/FT.) (4" DIA. = .653 GAL/FT.)]
(1" DIA.= .041 GAL/FT.) (1 1/4 " DIA.= .064 GAL/FT.)

Purge Device: **Peristaltic Pump/Bladder Pump (for VOC sample collection only\)**
Sample Time **11:30**
Sample Appearance **Slight H_2S odor. Clear in Tubing/Yellow outside**
Flow Rate: 500mL/min = 0.14mL/min

FIELD PARAMETERS

Time	Purged Vol. (gals)	pH	Cond. µmhos/cm	Temp., °C	DO	ORP	Turbidity	Depth to Water, FT BTOC	Color / Odor / Comments
1100	0.39	6.33	78,380	3.28	1.80	-294.1	23.1	2.8	Clear/Slight H2S odor
1105	1.09	6.31	78,096	30.23	0.80	-297.1	9.22	2.63	Clear/Slight H2S odor
1110	1.79	6.30	78,001	30.18	0.10	-298.3	5.34	2.6	Clear/Slight H2S odor
1115	2.49	6.31	78,216	30.19	0.00	-298.1	2.88	2.6	Clear/Slight H2S odor
1120	3.19	6.30	78,396	30.18	0.00	-297.7	2.19	2.61	Clear/Slight H2S odor
1125	3.89	6.30	78,477	30.19	0.00	-297.5	1.74	2.61	Clear/Slight H2S odor
1150	After Sampling	6.91	74,236	31.35	1.67	-260.8	1.99	2.61	Clear/Slight H2S odor
Analysis: Laboratory Analytical Parameters									
SO_4	Total Metals		VOC						
NO_3	Dissolved Metals		EXP						
NO_2	PERC		SVOC						
PO_4	ALK		PEST						

Signed by: **T. Casey**

09/07/2003 @ 1335
Date and Time

GROUNDWATER SAMPLING DATA SHEET

CH2M HILL, INC.

Project Number: **171119.FI.ZZ**

Client: **LANTDIV**
Location: **SWMU 6**
Event: **NASD, VIEQUES, RI/FS INVESTIGATION**
Date: **09/07/2003**
Weather: **Sunny/ Partly Cloudy**

Well ID: **NDW06MW08**
Sample ID: **NDW06GW08**
MS/MSD **YES** / NO
Sample Team: **T. Casey/S. Salazar**
E. Isern/F. Sengiali

Total Depth: **14.95** FT.(BTOC)
Depth to water: (-)**2.28** FT.(BTOC)
Water Column: **12.67** FT.
(x)**0.163** GAL/FT.
Well Volume: **2.06** GAL.
Total Purge Volume: **3.5** GAL.

Measuring Device: **Water Level Indicator**
Date and Time: **09/7/03 @ 1300**

WELL DIAMETER
[(2" DIA.= .163 GAL/FT.) (4" DIA. = .653 GAL/FT.)]
(1" DIA.= .041 GAL/FT.) (1 1/4 " DIA.= .064 GAL/FT.)

Purge Device: **Peristaltic Pump/Bladder Pump (for VOC sample collection only\)**
Sample Time **13:30**
Sample Appearance **Light gray/clear, slight H_2S odor**

Flow Rate: 500mL/min = 0.14mL/min

FIELD PARAMETERS

Time	Purged Vol. (gals)	pH	Cond. µmhos/cm	Temp., °C	DO	ORP	Turbidity	Depth to Water, FT BTOC	Color / Odor / Comments
1300	0.00	6.57	67,940	33.63	0.00	-304.8	7.51	2.28	Lt gray/clear, slight H2S odor
1305	0.70	6.47	67,570	32.38	0.00	-300.3	11.9	3.01	Lt gray/clear, slight H2S odor
1310	1.40	6.45	68,020	32.15	0.00	-298.1	5.37	3.04	Lt gray/clear, slight H2S odor
1315	2.10	6.47	68,560	32.02	0.00	-299.8	2.86	3.05	Lt gray/clear, slight H2S odor
1320	2.80	6.50	68,980	31.89	0.00	-297.7	2.81	3.15	Lt gray/clear, slight H2S odor
1325	3.50	6.52	69,270	31.93	0.00	-296.3	1.58	3.09	Lt gray/clear, slight H2S odor

Analysis: Laboratory Analytical Parameters

SO_4	Total Metals		VOC
NO_3	Dissolved Metals		EXP
NO_2	PERC		SVOC
PO_4	ALK		PEST

Signed by: **T. Casey**

9/7/03 @ 1335
Date and Time

GROUNDWATER SAMPLING DATA SHEET

CH2M HILL, INC.

Project Number: **171119.FI.ZZ**

Client: **LANTDIV**
Location: **SWMU - 6**
Event: **NASD, VIEQUES, RI/FS INVESTIGAITON**
Date: **02/11/2004**
Weather: **Sunny, 85 degrees Fahrenheit**

Well ID: **NDW06MW01**
Sample ID: **NDW06MW1 - 04**
MS/MSD YES / **NO**
Sample Team: **J. Swenfurth**
B. Brice

Total Depth: **16.66** FT.(BTOC)
Depth to water: **(-)4.07** FT.(BTOC)
Water Column: **12.59** FT.
(x).163 GAL/FT.
Well Volume: **2.1** GAL.
Total Purge Volume: **6.3** GAL.
Purge Device: **Peristaltic pump with Teflon tubing**
Sample Time **1115**
Sample Appearance **Clear with a yellow tint and sulfur odor**

Measuring Device: **Heron Water Level Indicator**
Date and Time: **02/11/04 1015**

WELL DIAMETER
[(2" DIA.= .163 GAL/FT.) (4" DIA. = .653 GAL/FT.)]
(1" DIA.= .041 GAL/FT.) (1 1/4 " DIA.= .064 GAL/FT.)

FIELD PARAMETERS

Time	Purged Vol. (gals)	pH	Cond. µmhos/cm	Temp., °C	DO	ORP	Turbidity	Color / Odor / Comments
1022	0.00	6.38	89,216	28.74	2.52	-269.3	135.00	Yellow tint/ strong H2S
1030	1.00	6.34	90,499	28.69	0.98	-324.1	183.00	Yellow tint/ strong H2S
1035	1.70	6.36	90,444	28.64	1.34	-328.0	132.00	Yellow tint/ strong H2S
1040	2.20	6.36	89,929	28.66	1.22	-325.1	52.90	Yellow tint/ strong H2S
1045	3.00	6.36	89,526	28.62	1.07	-332.0	30.00	Yellow tint/ strong H2S
1050	3.75	6.36	89,095	28.65	1.00	-330.9	16.00	Yellow tint/ strong H2S
1055	4.10	6.36	88,877	28.66	-0.07	-329.8	12.00	Yellow tint/ strong H2S
1100	4.75	6.36	88,740	28.65	-0.39	-331.6	8.98	Yellow tint/ strong H2S
1105	5.50	6.36	88,500	28.71	-0.57	-330.2	6.81	Yellow tint/ strong H2S
1110	6.10	6.36	88,314	28.70	-0.52	-327.2	5.63	Yellow tint/ strong H2S
1115	6.50	NA	NA	NA	NA	NA	3.84	Yellow tint/ strong H2S
Analysis: Laboratory Anaytical Parameters								
Perchlorate								
Notes: Flow rate: approximately 500 mL/min = 0.13 gal/min;								
- Depth to water stabilized at 4.11 ft btoc. throughout purging/sampling.								
- Field Duplicate collected. - Tubing set at 12.0 feet btoc.								

Signed by: **J. Swenfurth/B. Brice** **02/11/04 1115**

CH2MHILL

Surface Water Quality Sampling Field Data

SITE: **SWMU 6, NASD, Vieques**

FIELD CREW: **I. Lynch, R. Gorsira**

DATE: **10/01/2003** **CLOUD COVER:** **Sunny**

TIME: **9:20** **ANTECEDENT RAIN:** **None**

DEPTH OF WATER (FT): **4.0'-5.0'** **AMBIENT TEMPERATURE:** **90's**

FLOW VELOCITY AND DIRECTION: Tide change at 0900 hrs - tide was coming increasing velocity with time - tide was still very low while collecting this sample.

FIELD MEASUREMENTS

Time	Conductivity (µmhos)	DO (mg/L)	Salinity (ppt)	Temperature (°C)	pH (su)	ORP	Turbidity (NTU)	Location (% Total Depth)
9:15	55,770	2.07	36.9	29.04	8.24	80.0	5.73	0
9:20	55,810	2.02	36.95	29.10	8.22	74.5	5.82	50
9:25	56,000	1.95	37.08	28.86	8.34	51.8	NA	90

SAMPLE PARAMETERS (GRAB OR COMPOSITE**): VOC, SVOC, PEST, EXP, IONS, PERC, METALS, DISS MET**

OBSERVATIONS

COLOR: CLEAR , AMBER , TAN , BROWN , GREY , MILKY WHITE , **OTHER: Greenish Brown with algae**

ODOR: NONE , **LOW** , MEDIUM , HIGH , VERY STRONG , **H2S** , FUEL LIKE , CHEMICAL ?, UNKNOWN

TURBIDITY: NONE , **LOW** , MEDIUM , HIGH , VERY TURBID, HEAVY SILTS

COMMENTS: Dissolved metals were field filtered with 0.45mm in line filter. All samples were collected from a canoe with 12V Whale pump and TFE tubing at mid-depth. Leaves and other debris floating on the surface. Less silt in this canal bottom.

Sample ID NDW06SW02 - R01

OTHER: PLEASE USE BACK OF SHEET.FOR SKETCHING MAPS , **SEE BACK OF SHT** Y / **N.**

Q.C. SAMPLE TYPE: **DUPLICATE** , EQUIPMENT BLANK , OTHER : **NDW06FD02P - R01**

SIGNED/SAMPLER: **I. Lynch 10/01/03**

CH2MHILL

Surface Water Quality Sampling Field Data

SITE: SWMU 6, NASD, Vieques

FIELD CREW: I. Lynch, R. Gorsira

DATE: 10/01/2003 **CLOUD COVER:** Sunny

TIME: 8:45 **ANTECEDENT RAIN:** None

DEPTH OF WATER (FT): 1.0' - 1.5' **AMBIENT TEMPERATURE:** 90's

FLOW VELOCITY AND DIRECTION: Tide going out (Ebbing)

FIELD MEASUREMENTS

Time	Conductivity (µmhos)	DO (mg/L)	Salinity (ppt)	Temperature (°C)	pH (su)	ORP	Turbidity (NTU)	Location (% Total Depth)
8:45	55,740	2.51	36.86	28.82	8.20	68.0	7.69	50

SAMPLE PARAMETERS (GRAB OR COMPOSITE**): VOC, SVOC, PEST, EXP, IONS, PERC, METALS, DISS MET**

OBSERVATIONS

COLOR: CLEAR , AMBER , TAN , BROWN , GREY , MILKY WHITE , **OTHER: Greenish Brown with algae**

ODOR: NONE , **LOW** , MEDIUM , HIGH , VERY STRONG , **H2S** , FUEL LIKE , CHEMICAL ?, UNKNOWN

TURBIDITY: NONE , **LOW** , MEDIUM , HIGH , VERY TURBID, HEAVY SILTS. **Can See Bottom @1.5'**

COMMENTS: Dissolved metals were field filtered with 0.45mm in line filter. All samples were collected from a canoe with 12V Whale pump and TFE tubing at mid-depth. Leaves and other debris floating on the surface. Very silty bottom.

Sample ID NDW06SW03 - R01

OTHER: PLEASE USE BACK OF SHEET.FOR SKETCHING MAPS , **SEE BACK OF SHT** Y / **N.**

Q.C. SAMPLE TYPE: DUPLICATE , EQUIPMENT BLANK , OTHER :

SIGNED/SAMPLER: **I. Lynch 10/01/03**

Surface Water Quality Sampling Field Data

SITE: SWMU 6, NASD, Vieques

FIELD CREW: I. Lynch, R. Gorsira

DATE: 10/01/2003 **CLOUD COVER:** Sunny

TIME: 8:10 **ANTECEDENT RAIN:** None

DEPTH OF WATER (FT): 1.0' - 1.5' **AMBIENT TEMPERATURE:** 90's

FLOW VELOCITY AND DIRECTION: Tide going out slowly in this area (Ebbing)

FIELD MEASUREMENTS

Time	Conductivity (µmhos)	DO (mg/L)	Salinity (ppt)	Temperature (°C)	pH (su)	ORP	Turbidity (NTU)	Location (% Total Depth)
810	55,180	3.75	36.46	28.93	8.19	97.6	6.19	50

SAMPLE PARAMETERS (GRAB OR COMPOSITE**): VOC, SVOC, PEST, EXP, IONS, PERC, METALS, DISS MET**

OBSERVATIONS

COLOR: CLEAR , AMBER , TAN , BROWN , GREY , MILKY WHITE , **OTHER: Greenish Brown with algae**

ODOR: NONE , **LOW** , MEDIUM , HIGH , VERY STRONG , **H2S** , FUEL LIKE , CHEMICAL ?, UNKNOWN

TURBIDITY: NONE , **LOW** , MEDIUM , HIGH , VERY TURBID, HEAVY SILTS. **(Can see Bottom)**

COMMENTS: Dissolved metals were field filtered with 0.45mm in line filter. All samples were collected from a canoe with 12V Whale pump and TFE tubing at mid-depth. Leaves and other debris floating on the surface. Very silty bottom.

Sample ID NDW06SW05 - R01

OTHER: PLEASE USE BACK OF SHEET.FOR SKETCHING MAPS , **SEE BACK OF SHT** Y / **N.**

Q.C. SAMPLE TYPE: DUPLICATE , EQUIPMENT BLANK , OTHER :

SIGNED/SAMPLER: **I. Lynch 10/01/03**

CH2MHILL

Surface Water Quality Sampling Field Data

SITE: SWMU 6, NASD, Vieques

FIELD CREW: I. Lynch, R. Gorsira

DATE: 09/30/2003 **CLOUD COVER:** Sunny, Breezy

TIME: 14:20 **ANTECEDENT RAIN:** None

DEPTH OF WATER (FT): 6' **AMBIENT TEMPERATURE:** 90's

FLOW VELOCITY AND DIRECTION: Tide was coming in, fast moving water, from the north.

FIELD MEASUREMENTS

Time	Conductivity (µmhos)	DO (mg/L)	Salinity (ppt)	Temperature (°C)	pH (SU)	ORP	Turbidity (NTU)	Location (% Total Depth)
1420	55,860	6.03	36.9	30.98	7.77	88	14.9	0
1425	55,900	5.12	36.93	30.95	7.76	90.8	14.5	50
1430	55,900	5.13	36.92	30.91	7.76	74.8	NA	90

SAMPLE PARAMETERS (GRAB OR COMPOSITE**): VOC, SVOC, PEST, EXP, IONS, PERC, METALS, DISS MET**

OBSERVATIONS

COLOR: CLEAR , AMBER , TAN , BROWN , GREY , MILKY WHITE , **OTHER: Brownish green (with algae)**

ODOR: NONE , **LOW** , MEDIUM , HIGH , VERY STRONG , **H2S** , FUEL LIKE , CHEMICAL ?, UNKNOWN

TURBIDITY: NONE , **LOW** , MEDIUM , HIGH , VERY TURBID, HEAVY SILTS

COMMENTS: Dissolved metals were field filtered with 0.45mm in line filter. All samples were collected from a canoe with 12V Whale pump and TFE tubing at mid-depth. Strong winds to the west, very high tide, choppy. Sea grass (turtle grass) and leaves floating on top of the water. **Sample ID NDW06SW06 - R01**

OTHER: PLEASE USE BACK OF SHEET.FOR SKETCHING MAPS , **SEE BACK OF SHT** Y / **N.**

Q.C. SAMPLE TYPE: DUPLICATE , EQUIPMENT BLANK , OTHER :

SIGNED/SAMPLER: **I. Lynch 09/30/03**

CH2MHILL

Surface Water Quality Sampling Field Data

SITE: SWMU 6, NASD, Vieques

FIELD CREW: I. Lynch, R. Gorsira

DATE: 09/30/2003 **CLOUD COVER:** Sunny

TIME: 14:50 **ANTECEDENT RAIN:** None

DEPTH OF WATER (FT): 3.5' **AMBIENT TEMPERATURE:** 90's

FLOW VELOCITY AND DIRECTION: Wind-driven currents from east to west, windy, tide still coming in (tail end of high)

FIELD MEASUREMENTS

Time	Conductivity (µmhos)	DO (mg/L)	Salinity (ppt)	Temperature (°C)	pH (su)	ORP	Turbidity (NTU)	Location (% Total Depth)
1445	55,820	5.51	36.85	31.27	7.72	90.1	12.7	0
1450	55,780	5.15	36.84	31.0	7.71	92.1	17.7	50
1455	55,690	4.7	36.79	30.9	7.69	62.6	NA	90

SAMPLE PARAMETERS (GRAB OR COMPOSITE**): VOC, SVOC, PEST, EXP, IONS, PERC, METALS, DISS MET**

OBSERVATIONS

COLOR: CLEAR , AMBER , TAN , BROWN , GREY , MILKY WHITE , **OTHER: Greenish Brown with algae**

ODOR: NONE , **LOW** , MEDIUM , HIGH , VERY STRONG , H2S , FUEL LIKE , CHEMICAL ?, UNKNOWN

TURBIDITY: NONE , **LOW** , MEDIUM , HIGH , VERY TURBID, HEAVY SILTS

COMMENTS: Dissolved metals were field filtered with 0.45mm in line filter. All samples were collected from a canoe with 12V Whale pump and TFE tubing at mid-depth. Strong winds to the west, very high tide, choppy. Seagrass (turtle grass) and leaves floating on top.

Sample ID NDW06SW07 - R01

OTHER: PLEASE USE BACK OF SHEET.FOR SKETCHING MAPS , **SEE BACK OF SHT** Y / **N.**

Q.C. SAMPLE TYPE: DUPLICATE , EQUIPMENT BLANK , OTHER :

SIGNED/SAMPLER: **I. Lynch 09/30/03**

CH2MHILL

Surface Water Quality Sampling Field Data

SITE: SWMU 6, NASD, Vieques

FIELD CREW: I. Lynch, R. Gorsira

DATE: 10/01/2003 **CLOUD COVER:** Sunny , Breezy

TIME: 10:50 **ANTECEDENT RAIN:** None

DEPTH OF WATER (FT): 3" - 8" Deep **AMBIENT TEMPERATURE:** 90's

FLOW VELOCITY AND DIRECTION: At culvert flow is coming inland. Fair velocity, but still low tide

FIELD MEASUREMENTS

Time	Conductivity (µmhos)	DO (mg/L)	Salinity (ppt)	Temperature (°C)	pH (su)	ORP	Turbidity (NTU)	Location (% Total Depth)
11:00	55,830	2.2	36.92	29.31	7.81	- 69.9	10.2	50

SAMPLE PARAMETERS (GRAB OR COMPOSITE**): VOC, SVOC, PEST, EXP, IONS, PERC, METALS, DISS MET**

OBSERVATIONS

COLOR: CLEAR , AMBER , TAN , BROWN , GREY , MILKY WHITE , **OTHER: Greenish Brown with algae**

ODOR: NONE , **LOW** , MEDIUM , HIGH , VERY STRONG , **H2S** , FUEL LIKE , CHEMICAL ?, UNKNOWN

TURBIDITY: NONE , **LOW** , MEDIUM , HIGH , VERY TURBID, HEAVY SILTS. **Can see the bottom @ 0.5'**

COMMENTS: Dissolved metals were field filtered with 0.45mm in line filter. All samples were collected from a canoe with 12V Whale pump and TFE tubing at mid-depth. Leaves and other tidal debris floating on the surface and under water.

Sample ID NDW06 SW08 - R01

OTHER: PLEASE USE BACK OF SHEET.FOR SKETCHING MAPS , **SEE BACK OF SHT** Y / **N.**

Q.C. SAMPLE TYPE: DUPLICATE , EQUIPMENT BLANK , **OTHER : MS, MSD**

SIGNED/SAMPLER: **I. Lynch 10/01/03**

Surface Water Quality Sampling Field Data

SITE: **SWMU 6, NASD, Vieques**

FIELD CREW: **I. Lynch, R. Gorsira**

DATE: **10/01/2003** **CLOUD COVER:** **Sunny , Breezy**

TIME: **12:00** **ANTECEDENT RAIN:** **None**

DEPTH OF WATER (FT): **3" - 6" Deep** **AMBIENT TEMPERATURE:** **90's**

FLOW VELOCITY AND DIRECTION: Flow from the NE in the mangrove. Low flow tide coming in, collect sample upstream of tidal flow.

FIELD MEASUREMENTS

Time	Conductivity (µmhos)	DO (mg/L)	Salinity (ppt)	Temperature (°C)	pH (su)	ORP	Turbidity (NTU)	Location (% Total Depth)
1200	55,270	3.01	36.48	30.06	7.70	- 25	8.2	0

SAMPLE PARAMETERS (GRAB OR COMPOSITE**): VOC, SVOC, PEST, EXP, IONS, PERC, METALS, DISS MET**

OBSERVATIONS

COLOR: CLEAR , AMBER , TAN , BROWN , GREY , MILKY WHITE , **OTHER: Greenish Brown with some algae**

ODOR: NONE , **LOW** , MEDIUM , HIGH , VERY STRONG , **H2S** , FUEL LIKE , CHEMICAL ?, UNKNOWN

TURBIDITY: NONE , **LOW** , MEDIUM , HIGH , VERY TURBID, HEAVY SILTS. **Clear**

COMMENTS: Dissolved metals were field filtered with 0.45mm in line filter. Sample was collected with 12V Whale pump and TFE tubing at mid-depth. Debris from wetland area floating on surface and under surface of water. Waded out in mangroves 100' NE well MW06 to collect the sample. **Sample ID NDW06SW09 - R01**

OTHER: PLEASE USE BACK OF SHEET.FOR SKETCHING MAPS , **SEE BACK OF SHT** Y / **N.**

Q.C. SAMPLE TYPE: DUPLICATE , EQUIPMENT BLANK , OTHER :

SIGNED/SAMPLER: **I. Lynch 10/01/03**

CH2MHILL

Surface Water Quality Sampling Field Data

SITE: SWMU 6, NASD, Vieques

FIELD CREW: I. Lynch, R. Gorsira

DATE: 09/30/2003 **CLOUD COVER:** Sunny

TIME: 15:45 **ANTECEDENT RAIN:** None

DEPTH OF WATER (FT): 1' or less **AMBIENT TEMPERATURE:** 90's

FLOW VELOCITY AND DIRECTION: Very little current, high tide still coming in

FIELD MEASUREMENTS

Time	Conductivity (µmhos)	DO (mg/L)	Salinity (ppt)	Temperature (°C)	pH (su)	ORP	Turbidity (NTU)	Location (% Total Depth)
1545	62,840	6.92	42.02	34.6	7.94	95.1	9.07	0

SAMPLE PARAMETERS (GRAB OR COMPOSITE**): VOC, SVOC, PEST, EXP, IONS, PERC, METALS, DISS MET**

OBSERVATIONS

COLOR: CLEAR , AMBER , TAN , BROWN , GREY , MILKY WHITE , **OTHER: Greenish Brown with algae**

ODOR: NONE , **LOW** , MEDIUM , HIGH , VERY STRONG , **H2S** , FUEL LIKE , CHEMICAL ?, UNKNOWN

TURBIDITY: NONE , **LOW** , MEDIUM , HIGH , VERY TURBID, HEAVY SILTS. **Can see Bottom at 1.0'**

COMMENTS: Dissolved metals were field filtered with 0.45mm in line filter. All samples were collected from a canoe with 12V Whale pump and TFE tubing at mid-depth. Collected in Arenas Lagoon for background.

Sample ID NDW06SW10K - R01collected at SD-15 location

OTHER: PLEASE USE BACK OF SHEET.FOR SKETCHING MAPS , **SEE BACK OF SHT** Y / **N.**

Q.C. SAMPLE TYPE: DUPLICATE , EQUIPMENT BLANK , OTHER :

SIGNED/SAMPLER: **I. Lynch 09/30/03**

CH2MHILL

Surface Water Quality Sampling Field Data

SITE: SWMU 6, NASD, Vieques

FIELD CREW: I. Lynch, R. Gorsira

DATE: 09/30/2003 **CLOUD COVER:** Sunny

TIME: 1615 **ANTECEDENT RAIN:** None

DEPTH OF WATER (FT): 3' **AMBIENT TEMPERATURE:** 90's

FLOW VELOCITY AND DIRECTION: None obvious, a little wind driven current.

FIELD MEASUREMENTS

Time	Conductivity (µmhos)	DO (mg/L)	Salinity (ppt)	Temperature (°C)	pH (su)	ORP	Turbidity (NTU)	Location (% Total Depth)
1610	60,660	3.09	40.82	32.7	7.80	+ 104	9.31	0
1615	63,400	3.01	42.59	31.60	7.82	- 120.0	NA	90

SAMPLE PARAMETERS (GRAB OR COMPOSITE**): VOC, SVOC, PEST, EXP, IONS, PERC, METALS, DISS MET**

OBSERVATIONS

COLOR: CLEAR , AMBER , TAN , BROWN , GREY , MILKY WHITE , **OTHER: Greenish Brown with algae**

ODOR: NONE , **LOW** , MEDIUM , HIGH , VERY STRONG , **H2S** , FUEL LIKE , CHEMICAL ?, UNKNOWN

TURBIDITY: NONE , **LOW** , MEDIUM , HIGH , VERY TURBID, HEAVY SILTS

COMMENTS: Dissolved metals were field filtered with 0.45mm in line filter. All samples were collected from a canoe with 12V Whale pump and TFE tubing at mid-depth. Collected in Arenas Lagoon for background.

Sample ID NDW06SW11K - R01 collected at SD-16 location.

OTHER: PLEASE USE BACK OF SHEET.FOR SKETCHING MAPS , **SEE BACK OF SHT Y / N.**

Q.C. SAMPLE TYPE: DUPLICATE , EQUIPMENT BLANK , OTHER :

SIGNED/SAMPLER: **I. Lynch 09/30/03**

PROJECT NUMBER	BORING NUMBER	
17119.FI.ZZ	NDW06SD02	SHEET 1 OF 1

SEDIMENT LOG

PROJECT : **NASD RI/FS INVESTIGATION** LOCATION : **SWMU6** DATE: **09/03/03**

WEATHER: **Sunny, Hot, Slight Wind** DRILLING CONTRACTOR : **CH2M HILL**

DRILLING METHOD AND EQUIPMENT USED : **Ponar with stainless steel pan and spoon out of canoe**

WATER LEVELS : **4ft** START : **9/3/03 @ 1230** END: **9/3/03 @ 1245** LOGGER : **R. Gorsira**

DEPTH BELOW SURFACE (FT)	INTERVAL (FT)	RECOVERY (IN)	#/TYPE	STANDARD PENETRATION TEST RESULTS 6"-6"-6"-6" (N)	CORE DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION. OVM (ppm): Breathing Zone Above Hole
0.5	0.5	6	Ponar	NA	0.0 to 0.5' SAND (SP), dark gray, coarse, saturated, shell fragments (80%), trace detritus.	Slight H2S odor Strong incoming tide and current Sample collected at mid-channel. Sample **NDW06SD02-R01, NDW06FD03P-R01** collected @ 1245
					END OF BORING @ 0.5 FEET	
1.0						
1.5						
2.0						
2.5						

Sampler Signature: **R. Gorsira** Date: **09/03/2003**

PROJECT NUMBER	BORING NUMBER	
17119.FI.ZZ	NDW06SD03	SHEET 1 OF 1

SEDIMENT LOG

PROJECT : **NASD RI/FS INVESTIGATION** LOCATION : **SWMU6** DATE: **09/03/03**

WEATHER: **Sunny, Hot, Slight Wind** DRILLING CONTRACTOR : **CH2M HILL**

DRILLING METHOD AND EQUIPMENT USED : **Ponar with stainless steel pan and spoon out of canoe**

WATER LEVELS : **NA** START : **9/3/03 @ 1115** END : **9/3/03 @ 1140** LOGGER : **R. Gorsira**

DEPTH BELOW SURFACE (FT)	INTERVAL (FT)	RECOVERY (IN)	#/TYPE	STANDARD PENETRATION TEST RESULTS 6"-6"-6"-6" (N)	CORE DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION. OVM (ppm): Breathing Zone Above Hole
	0.5	6	Ponar	NA	0.0 to 0.2' PEAT (PT), dark gray, saturated, very soft, leaf detritus. 0.2' to 0.5' PEAT (PT), dark gray, saturated, very soft, shell fragments (30%)	Hydrogen sulfite odor Sample **NDW06SD03-R01** collected @ 1140
0.5					END OF BORING @ 0.5 FEET	
1.0						
1.5						
2.0						
2.5						

Sampler Signature: **R. Gorsira** Date: **09/03/2003**

PROJECT NUMBER	BORING NUMBER	
17119.FI.ZZ	NDW06SD05	SHEET 1 OF 1

SEDIMENT LOG

PROJECT : **NASD RI/FS INVESTIGATION** LOCATION : **SWMU6** DATE: **09-03-03**

WEATHER: **Sunny, hot, slight wind** DRILLING CONTRACTOR : **CH2M HILL**

DRILLING METHOD AND EQUIPMENT USED : **Ponar with stainless steel pan and spoon out of canoe**

WATER LEVELS : **1.5 ft** START : **9/03/03 @ 1100** END: **9/03/03 @ 1115** LOGGER : **R. Gorsira**

DEPTH BELOW SURFACE (FT)	INTERVAL (FT)	RECOVERY (IN)	#/TYPE	STANDARD PENETRATION TEST RESULTS 6"-6"-6"-6" (N)	CORE DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION. OVM (ppm): Breathing Zone Above Hole
	0.5	6	Ponar	NA	0.0 to 0.5' PEAT (PT), black, saturated, very soft, trace organic detritus, some silt	Hydrogen sulfide odor No Flow Sample **NDW06SD05-R01** collected @ 1115
0.5					END OF BORING @ 0.5 FEET	
1.0						
1.5						
2.0						
2.5						

Sampler Signature: **R. Gorsira** Date: **09/03/2003**

PROJECT NUMBER	BORING NUMBER	
17119.FI.ZZ	NDW06SD06	SHEET 1 OF 1

SEDIMENT LOG

PROJECT : **NASD RI/FS INVESTIGATION** LOCATION : **SWMU6** DATE: **09-04-03**

WEATHER: **Sunny, hot, slight wind** DRILLING CONTRACTOR : **CH2M HILL**

DRILLING METHOD AND EQUIPMENT USED : **Ponar with stainless steel pan and spoon out of canoe**

WATER LEVELS : **4.5 ft** START : **9/04/03 @ 1115** END : **9/04/03 @ 1130** LOGGER : **R. Gorsira**

DEPTH BELOW SURFACE (FT)	INTERVAL (FT)	RECOVERY (IN)	#/TYPE	STANDARD PENETRATION TEST RESULTS 6"-6"-6"-6" (N)	CORE DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION. OVM (ppm): Breathing Zone Above Hole
		6	Ponar	NA	0.0 to 0.5' PEAT (PT), dark gray, saturated, very soft, few organic detritus, some shell fragments, some larger bivalves shells.	H2S odor Sample **NDW06SD06-R01** collected @ 1130
0.5	0.5				END OF BORING @ 0.5 FEET	
1.0						
1.5						
2.0						
2.5						

Sampler Signature: **R. Gorsira** Date: **09/04/2003**

CH2MHILL

PROJECT NUMBER	BORING NUMBER	
17119.FI.ZZ	NDW06SD07	SHEET 1 OF 1

SEDIMENT LOG

PROJECT : **NASD RI/FS INVESTIGATION** LOCATION : **SWMU6** DATE: **09-04-03**

WEATHER: **Sunny, hot, slight wind** DRILLING CONTRACTOR : **CH2M HILL**

DRILLING METHOD AND EQUIPMENT USED : **Ponar with stainless steel pan and spoon out of canoe**

WATER LEVELS : **2.5 ft** START : **9/04/03 @ 0830** END : **9/04/03 @ 0840** LOGGER : **R. Gorsira**

DEPTH BELOW SURFACE (FT)	INTERVAL (FT)	RECOVERY (IN)	#/TYPE	STANDARD PENETRATION TEST RESULTS 6"-6"-6"-6" (N)	CORE DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION. OVM (ppm): Breathing Zone Above Hole
	0.5	6	Ponar	NA	0.0 to 0.5' PEAT (PT), dark gray, saturated, very soft, some shell fragments, few decaying wood few live bivalves, trace silt.	Strong H2S odor Sample **NDW06SD07-R01** collected @ 0840
0.5					END OF BORING @ 0.5 FEET	
1.0						
1.5						
2.0						
2.5						

Sampler Signature: **R. Gorsira** Date: **09/04/2003**

PROJECT NUMBER	BORING NUMBER	
17119.FI.ZZ	NDW06SD08	SHEET 1 OF 1

SEDIMENT LOG

PROJECT : **NASD RI/FS INVESTIGATION** LOCATION : **SWMU6** DATE: **09-04-03**

WEATHER: **Sunny, hot, slight wind** DRILLING CONTRACTOR : **CH2M HILL**

DRILLING METHOD AND EQUIPMENT USED : **Ponar with stainless steel pan and spoon out of canoe**

WATER LEVELS : **2.5 ft** START : **9/04/03 @ 0840** END : **9/04/03 @ 0905** LOGGER : **R. Gorsira**

DEPTH BELOW SURFACE (FT)	INTERVAL (FT)	RECOVERY (IN)	#/TYPE	STANDARD PENETRATION TEST RESULTS 6"-6"-6"-6" (N)	CORE DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION. OVM (ppm): Breathing Zone Above Hole
	0.5	6	Ponar	NA	0.0 to 0.5' PEAT (PT), dark gray, saturated, very soft, some shell fragments, few decaying wood, few live bivalves, trace silt.	Strong H2S odor Sample **NDW06SD08-R01** collected @ 0905 Also collected **MS, MSD** at this location
0.5					END OF BORING @ 0.5 FEET	
1.0						
1.5						
2.0						
2.5						

Sampler Signature: **R. Gorsira** Date: **09/04/2003**

CH2MHILL

PROJECT NUMBER	BORING NUMBER	
17119.FI.ZZ	NDW06SD09	SHEET 1 OF 1

SEDIMENT LOG

PROJECT : **NASD RI/FS INVESTIGATION** LOCATION : **SWMU6** DATE: **09-04-03**

WEATHER: **Sunny, hot, slight wind** DRILLING CONTRACTOR : **CH2M HILL**

DRILLING METHOD AND EQUIPMENT USED : **Ponar with stainless steel pan and spoon out of canoe**

WATER LEVELS : **2.5 ft** START : **9/04/03 @ 0905** END : **9/04/03 @ 0945** LOGGER : **R. Gorsira**

DEPTH BELOW SURFACE (FT)	INTERVAL (FT)	RECOVERY (IN)	#/TYPE	STANDARD PENETRATION TEST RESULTS 6"-6"-6"-6" (N)	CORE DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION. OVM (ppm): Breathing Zone Above Hole
	0.5	6	Ponar	NA	0.0 to 0.5' PEAT (PT), very dark gray, saturated, very soft, some wood fibers and ditritus, some fine sand.	Strong H2S odor Sample **NDW06SD09-R01** collected @ 0945
0.5					END OF BORING @ 0.5 FEET	
1.0						
1.5						
2.0						
2.5						

Sampler Signature: **R. Gorsira** Date: **09/04/2003**

PROJECT NUMBER	BORING NUMBER	
17119.FI.ZZ	NDW06SD10	SHEET 1 OF 1

SEDIMENT LOG

PROJECT : **NASD RI/FS INVESTIGATION** LOCATION : **SWMU6** DATE: **09-04-03**

WEATHER: **Sunny, hot, slight wind** DRILLING CONTRACTOR : **CH2M HILL**

DRILLING METHOD AND EQUIPMENT USED : **Ponar with stainless steel pan and spoon out of canoe**

WATER LEVELS : **2.5 ft** START : **9/04/03 @ 0905** END: **9/04/03 @ 1025** LOGGER : **R. Gorsira**

DEPTH BELOW SURFACE (FT)	INTERVAL (FT)	RECOVERY (IN)	#/TYPE	STANDARD PENETRATION TEST RESULTS 6"-6"-6"-6" (N)	CORE DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION. OVM (ppm): Breathing Zone Above Hole
	0.5	6	HA	NA	0.0 to 0.2' SAND (SP), brown, saturated, medium to coarse sand, very loose, mostly shell fragments 0.2' to 0.5' SAND (SP), dark grey/black, saturated, loose, some coarse gravel and cobbles.	Petroleum like odor in the dark/lower portion of the sample. Sample **NDW06SD10-R01** collected @ 1025
0.5					END OF BORING @ 0.5 FEET	**NOTES:** Sample location is approximately 20 ft North of historic rail road/bridge crossing, rampant pilings wood trusses still visible across creek High tide with turning ebbing tide. High water velocity in center of channel Hard bottom with many rocks apparent when probing with hand auger.
1.0						
1.5						
2.0						
2.5						

Sampler Signature: **R. Gorsira** Date: **09/04/2003**

CH2MHILL

PROJECT NUMBER	BORING NUMBER	
17119.FI.ZZ	NDW06SD11	SHEET 1 OF 1

SEDIMENT LOG

PROJECT : **NASD RI/FS INVESTIGATION** LOCATION : **SWMU6** DATE: **09-03-03**

WEATHER: **Sunny, hot, slight wind** DRILLING CONTRACTOR : **CH2M HILL**

DRILLING METHOD AND EQUIPMENT USED : **Ponar with stainless steel pan and spoon out of canoe**

WATER LEVELS : **1.0 ft** START : **9/03/03 @ 1245** END: **9/03/03 @ 1345** LOGGER : **R. Gorsira**

DEPTH BELOW SURFACE (FT)	INTERVAL (FT)	RECOVERY (IN)	#/TYPE	STANDARD PENETRATION TEST RESULTS 6"-6"-6"-6" (N)	CORE DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION. OVM (ppm): Breathing Zone Above Hole
	0.5	6	Ponar	NA	0.0' to 0.5' SAND (SP), dark gray, saturated, loose, fine to medium sand, shell fragments.	Slight H2S odor Sample **NDW06SD11-R01** collected @ 1345
0.5					END OF BORING @ 0.5 FEET	
1.0						
1.5						
2.0						
2.5						

Sampler Signature: **R. Gorsira** Date: **09/03/2003**

CH2MHILL

PROJECT NUMBER	BORING NUMBER	
17119.FI.ZZ	NDW06SD12	SHEET 1 OF 1

SEDIMENT LOG

PROJECT : **NASD RI/FS INVESTIGATION** LOCATION : **SWMU6** DATE: **09-04-03**

WEATHER: **Sunny, hot, slight wind** DRILLING CONTRACTOR : **CH2M HILL**

DRILLING METHOD AND EQUIPMENT USED : **Ponar with stainless steel pan and spoon out of canoe**

WATER LEVELS : **1.0 ft** START: **9/04/03 @ 1025** END: **9/04/03 @ 1100** LOGGER : **R. Gorsira**

DEPTH BELOW SURFACE (FT)	INTERVAL (FT)	RECOVERY (IN)	#/TYPE	STANDARD PENETRATION TEST RESULTS 6"-6"-6"-6" (N)	CORE DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION. OVM (ppm): Breathing Zone Above Hole
	0.5	6	Ponar	NA	0.0' to 0.5' SAND (SP), dark gray, saturated, soft, fine to medium sand, shell fragments, some very fine silts.	Slight H2S odor Sample **NDW06SD12-R01** collected @ 1100
0.5					END OF BORING @ 0.5 FEET	
1.0						
1.5						
2.0						
2.5						

Sampler Signature: **R. Gorsira** Date: **09/04/2003**

CH2MHILL

PROJECT NUMBER	BORING NUMBER	
17119.FI.ZZ	NDW06SD13	SHEET 1 OF 1

SEDIMENT LOG

PROJECT : **NASD RI/FS INVESTIGATION** LOCATION : **SWMU6** DATE: **09-03-03**

WEATHER: **Sunny, hot, slight wind** DRILLING CONTRACTOR : **CH2M HILL**

DRILLING METHOD AND EQUIPMENT USED : **Ponar with stainless steel pan and spoon out of canoe**

WATER LEVELS : **3.0 ft** START : **9/3/03 @ 1315** END: **9/3/03 @ 1330** LOGGER : **R. Gorsira**

DEPTH BELOW SURFACE (FT)	INTERVAL (FT)	RECOVERY (IN)	#/TYPE	STANDARD PENETRATION TEST RESULTS 6"-6"-6"-6" (N)	CORE DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION. OVM (ppm): Breathing Zone Above Hole
0.5	0.5	6	Ponar	NA	0.0 to 0.5' SAND (SP), dark gray, saturated, medium sand, shell fragments (80%), trace detritus.	Slight H2S odor Strong incoming tide and current Sample collected at mid-channel. Sample **NDW06SD13-R01** collected @ 1330
					END OF BORING @ 0.5 FEET	
1.0						
1.5						
2.0						
2.5						

Sampler Signature: **R. Gorsira** Date: **09/03/2003**

CH2MHILL

PROJECT NUMBER	BORING NUMBER	
17119.FI.ZZ	NDW06SD14	SHEET 1 OF 1

SEDIMENT LOG

PROJECT : **NASD RI/FS INVESTIGATION** LOCATION : **SWMU6** DATE: **09-03-03**

WEATHER: **Sunny, hot, slight wind** DRILLING CONTRACTOR : **CH2M HILL**

DRILLING METHOD AND EQUIPMENT USED : **Ponar with stainless steel pan and spoon out of canoe**

WATER LEVELS : **1.0 ft** START : **9/3/03 @ 1140** END: **9/3/03 @ 1230** LOGGER : **R. Gorsira**

DEPTH BELOW SURFACE (FT)	INTERVAL (FT)	RECOVERY (IN)	#/TYPE	STANDARD PENETRATION TEST RESULTS 6"-6"-6"-6" (N)	CORE DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION. OVM (ppm): Breathing Zone Above Hole
0.5	0.5	6	Ponar	NA	0.0 to 0.5' SAND (SP), dark gray, saturated, medium sand, shell fragments (70%), trace detritus, some organic silts.	Slight H2S odor Sample **NDW06SD14-R01** collected @ 1230 Strong incoming tide Strong current
					END OF BORING @ 0.5 FEET	NOTES: Pistil shrimp present in sample. Seagrass and macro algal fragment
1.0						
1.5						
2.0						
2.5						

Sampler Signature: **R. Gorsira** Date: **09/03/2003**

CH2MHILL

PROJECT NUMBER	BORING NUMBER	
17119.FI.ZZ	NDW06SD15	SHEET 1 OF 1

SEDIMENT LOG

PROJECT : **NASD RI/FS INVESTIGATION** LOCATION : **SWMU6** DATE: **09-05-03**

WEATHER: **Sunny, hot, slight wind** DRILLING CONTRACTOR : **CH2M HILL**

DRILLING METHOD AND EQUIPMENT USED : **Ponar with stainless steel pan and spoon out of canoe**

WATER LEVELS : **0.5 ft** START : **9/5/03 @ 0900** END: **9/5/03 @ 0945** LOGGER : **R. Gorsira**

DEPTH BELOW SURFACE (FT)	INTERVAL (FT)	RECOVERY (IN)	#/TYPE	STANDARD PENETRATION TEST RESULTS 6"-6"-6"-6" (N)	CORE DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION. OVM (ppm): Breathing Zone Above Hole
		6	Ponar	NA	0.0 to 0.5' PEAT (PT), dark brown, saturated, very soft, few fine sand, trace organic detritus, trace shell fragments.	Strong H2S odor
0.5	0.5				END OF BORING @ 0.5 FEET	NOTES: Located at North of the Bridge (Laguna Arenas)
1.0						
1.5						
2.0						
2.5						

Sampler Signature: **R. Gorsira** Date: **09/05/2003**

PROJECT NUMBER	BORING NUMBER	
17119.FI.ZZ	NDW06SD16	SHEET 1 OF 1

SEDIMENT LOG

PROJECT : **NASD RI/FS INVESTIGATION** LOCATION : **SWMU6** DATE: **09-05-03**

WEATHER: **Sunny, hot, slight wind** DRILLING CONTRACTOR : **CH2M HILL**

DRILLING METHOD AND EQUIPMENT USED : **Ponar with stainless steel pan and spoon out of canoe**

WATER LEVELS : **2.0 ft** START : **9/5/03 @ 0845** END: **9/5/03 @ 0900** LOGGER : **R. Gorsira**

DEPTH BELOW SURFACE (FT)	INTERVAL (FT)	RECOVERY (IN)	#/TYPE	STANDARD PENETRATION TEST RESULTS 6"-6"-6"-6" (N)	CORE DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION. OVM (ppm): Breathing Zone Above Hole
		6	Ponar	NA	0.0 to 0.2' PEAT (PT), orange-brown, saturated, very soft, organic detritus and fibrous hummus. 0.2' to 0.5' ORGANIC CLAY (OH), light gray, saturated, very soft, large shell fragments.	Strong H2S odor
0.5	0.5				END OF BORING @ 0.5 FEET	**NOTES:** Searched lagoon on the center and west side searching for suitable sampling locations. Peat layer in excess of 6 ft at these locations. Sample taken a bit more NE of the original SD16 site (Drawing demostrating the proximity of origin SD15 sample and the original SD16 sample and where the actual sample (SD16) was tak in Laguna Arenas)
1.0						
1.5						
2.0						
2.5						

Sampler Signature: **R. Gorsira** Date: **09/05/2003**

APPENDIX G

SWMU 6 Survey Data Points

Vieques Island, Puerto Rico

LOCATION	NORTHING	EASTING	ELEVATION (meters)	MATRIX	Elevation (feet)
NDAJMW05	2005187.9005	229984.5224	2.566	MW	8.419
NDAJSB09	2005186.1093	229980.0231	1.511	SB	4.957
NDAJSS09	2005186.1093	229980.0231	1.511	SS	4.957
NDAJSB10	2005195.3238	229971.3230	1.324	SB	4.344
NDAJSS10	2005195.3238	229971.3230	1.324	SS	4.344
NDAJMW06	2005212.0613	229981.3548	2.296	MW	7.533
NDAJMW08	2005155.7399	229956.6115	2.876	MW	9.436
NDAJSD05	2005235.9091	230001.5090	-0.268	SD	-0.879
NDAJSW05	2005235.9091	230001.5090	-0.268	SW	-0.879
NDAJSD03	2005211.1959	230011.0320	-0.268	SD	-0.879
NDAJSW03	2005211.1959	230011.0320	-0.268	SW	-0.879
NDAJSD01	2005176.6921	230010.6640	-0.268	SD	-0.879
NDAJSS01	2005176.6921	230010.6640	-0.268	SS	-0.879
NDAJSW06	2005139.1232	230012.0409	-0.268	SW	-0.879
NDAJSW07	2005114.2501	230016.0917	-0.268	SW	-0.879
NDAJSW08	2005073.7458	230014.8352	-0.268	SW	-0.879
NDAJSW04 (OLD)	2005183.3354	230003.5035	1.984	SW	6.509
NDAJSS06	2005146.7755	229999.9001	2.296	SS	7.533
NDAJSB06	2005146.7755	229999.9001	2.296	SB	7.533
NDAJMW03 (OLD)	2005151.0208	229994.4657	3.011	MW	9.879
NDAJMW07	2005130.8923	230000.8775	3.224	MW	10.577
NDAJSS07	2005129.6690	230004.9475	2.289	SS	7.510
NDAJSB07	2005129.6690	230004.9475	2.289	SB	7.510
NDAJSS08	2005113.0237	230003.8939	2.326	SS	7.631
NDAJSB08	2005113.0237	230003.8939	2.326	SB	7.631
NDAJMW09	2005215.8768	230030.2994	2.260	MW	7.415
NDW06MW07	2005123.9511	229085.6294	0.371	MW	1.217
NDW06MW08	2005166.3333	229144.8558	0.294	MW	0.965
NDW06MW05	2005084.8047	228926.9912	0.608	MW	1.995
NDW06MW06	2005087.1604	228999.6686	0.667	MW	2.188
NDW06SS13	2005095.6450	228928.4717	-0.208	SS	-0.682
NDW06SB13	2005095.6450	228928.4717	-0.208	SB	-0.682
NDW06SB23	2005106.5957	228919.0981	-0.247	SB	-0.810
NDW06SS10	2005103.1424	228969.9926	-0.225	SS	-0.738
NDW06SB10	2005103.1424	228969.9926	-0.225	SB	-0.738
NDW06SS09	2005099.5381	228971.0322	-0.197	SS	-0.646
NDW06SB09	2005099.5381	228971.0322	-0.197	SB	-0.646
NDW06SS11	2005106.8421	228974.1226	-0.311	SS	-1.020
NDW06SB11	2005106.8421	228974.1226	-0.311	SB	-1.020
NDW06SS12	2005103.9311	228976.8327	-0.313	SS	-1.027
NDW06SB12	2005103.9311	228976.8327	-0.313	SB	-1.027
NDW06SS18	2005107.3233	228981.0855	-0.394	SS	-1.293
NDW06SB18	2005107.3233	228981.0855	-0.394	SB	-1.293
NDW06SS17	2005111.9954	228980.2082	-0.377	SS	-1.237
NDW06SB17	2005111.9954	228980.2082	-0.377	SB	-1.237
NDW06SS16	2005119.1732	228978.0738	-0.354	SS	-1.161
NDW06SB16	2005119.1732	228978.0738	-0.354	SB	-1.161
NDW06SS15	2005119.6790	228972.3818	-0.405	SS	-1.329
NDW06SB15	2005119.6790	228972.3818	-0.405	SB	-1.329
NDW06SS14	2005113.0277	228966.6157	-0.358	SS	-1.175

NDW06SB14	2005113.0277	228966.6157	-0.358	SB	-1.175
NDW06SW09	2005144.1059	229030.2056	-0.397	SW	-1.302
NDW06SS21	2005092.7849	229000.3693	-0.335	SS	-1.099
NDW06SB21	2005092.7849	229000.3693	-0.335	SB	-1.099
NDW06SS22	2005097.5658	229012.0329	-0.353	SS	-1.158
NDW06SB22	2005097.5658	229012.0329	-0.353	SB	-1.158
NDW06SS20	2005111.1818	229019.6890	-0.325	SS	-1.066
NDW06SB20	2005111.1818	229019.6890	-0.325	SB	-1.066
NDW06SS19	2005101.2975	228982.4597	-0.403	SS	-1.322
NDW06SB19	2005101.2975	228982.4597	-0.403	SB	-1.322
NDW06SD10	2005037.9901	228926.6101	-1.432	SD	-4.698
NDW06SD11	2005040.7826	228931.7005	-0.937	SD	-3.074
NDW06SD09	2004964.9626	228975.2998	-1.248	SD	-4.094
NDW06SD08	2004965.9398	229062.0735	-1.306	SD	-4.285
NDW06SD07	2005013.6464	229186.0681	-1.260	SD	-4.134
NDW06SD06	2004638.2397	228700.0409	-1.518	SD	-4.980
NDW06SD13	2005052.8636	228922.1839	-1.394	SD	-4.573
NDW06SD12	2005051.5733	228917.7086	-1.526	SD	-5.007
NDW06SD03	2005112.7555	228915.3806	-1.081	SD	-3.547
NDW06SD14	2005120.5198	228900.2491	-0.857	SD	-2.812
NDW06SD05	2005119.8667	228941.5796	-1.018	SD	-3.340
NDW06SW10	2004703.7365	228150.1794	-0.528	SW	-1.732
NDW06SD15	2004703.7365	228150.1794	-0.528	SD	-1.732
NDW06SW11	2005005.5060	228203.3643	-1.197	SW	-3.927
NDW06SD16	2005005.5060	228203.3643	-1.197	SD	-3.927
NDW06SW08	2005108.5423	229013.3736	-0.381	SW	-1.250
NDAHSS29	2006037.3785	233087.0447	2.342	SS	7.684
NDAHSB29	2006037.3785	233087.0447	2.342	SB	7.684
NDAHSS18	2006034.3403	233094.5574	2.488	SS	8.163
NDAHSB18	2006034.3403	233094.5574	2.488	SB	8.163
NDAHSS19	2006032.3892	233104.5813	2.677	SS	8.783
NDAHSB19	2006032.3892	233104.5813	2.677	SB	8.783
NDAHSS20	2006044.0734	233109.8721	2.617	SS	8.586
NDAHSB20	2006044.0734	233109.8721	2.617	SB	8.586
NDAHSS21	2006052.4757	233108.0936	2.358	SS	7.736
NDAHSB21	2006052.4757	233108.0936	2.358	SB	7.736
NDAHSS22	2006057.9443	233102.9168	2.035	SS	6.676
NDAHSB22	2006057.9443	233102.9168	2.035	SB	6.676
NDAHSS23	2006062.8715	233100.6571	1.797	SS	5.896
NDAHSB23	2006062.8715	233100.6571	1.797	SB	5.896
NDAHSS24	2006070.3758	233099.0019	1.668	SS	5.472
NDAHSB24	2006070.3758	233099.0019	1.668	SB	5.472
NDAHSS25	2006074.5020	233089.9264	1.132	SS	3.714
NDAHSB25	2006074.5020	233089.9264	1.132	SB	3.714
NDAHMW06	2006054.5730	233097.2942	3.037	MW	9.964
NDAHSD05	2006002.8789	233086.5382	0.426	SD	1.398
NDAHSS28	2006044.0516	233082.9703	1.873	SS	6.145
NDAHSB28	2006044.0516	233082.9703	1.873	SB	6.145
NDAHMW05	2006060.9216	233080.0478	2.295	MW	7.530
NDAHMW07	2006076.3062	233076.5103	1.756	MW	5.761
NDAHSS27	2006059.6069	233077.6844	1.238	SS	4.062

NDAHSB27	2006059.6069	233077.6844	1.238	SB	4.062
NDAHSS26	2006072.6188	233082.7231	0.958	SS	3.143
NDAHSB26	2006072.6188	233082.7231	0.958	SB	3.143
NDAHSS17	2006033.9391	233087.5917	2.676	SS	8.780
NDAHSB17	2006033.9391	233087.5917	2.676	SB	8.780
NDAHMW02 (OLD)	2006065.5152	233078.0043	1.771	MW	5.810
NDAHMW04 (OLD)	2006071.0747	233092.3672	1.953	MW	6.407
NDAHSD04	2006054.6881	233068.8617	-0.323	SD	-1.060
NDAHSW04	2006054.6881	233068.8617	-0.323	SW	-1.060
NDAHSD03	2006081.3024	233064.0805	-0.323	SD	-1.060
NDAHSW03	2006081.3024	233064.0805	-0.323	SW	-1.060
NDAHSD02	2006105.7829	233060.6586	-0.323	SD	-1.060
NDAHSW02	2006105.7829	233060.6586	-0.323	SW	-1.060
NDAHSD01	2006156.5358	233040.5081	-0.323	SD	-1.060
NDAHSW01	2006156.5358	233040.5081	-0.323	SW	-1.060
NDW07MW08	2004987.4453	231689.1040	31.720	MW	104.068
NDW07SS19	2004989.2000	231646.4100	21.510	SS	70.571
NDW07SS18	2005004.7932	231632.4951	18.222	SS	59.783
NDW07SB15	2005006.6368	231631.9268	18.764	SB	61.561
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NDW07SB10	2005017.5126	231611.5464	16.314	SB	53.523
NDW07SS10	2005017.5126	231611.5464	16.314	SS	53.523
NDW07SS09	2005036.3430	231604.9954	18.379	SS	60.298
NDW07SB09	2005036.3430	231604.9954	18.379	SB	60.298
NDW07SS07	2005070.1236	231587.6962	14.787	SS	48.514
NDW07SB07	2005070.1236	231587.6962	14.787	SB	48.514
NDW07SS08	2005069.5062	231583.9881	13.576	SS	44.541
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NDW07SS13	2005088.8284	231588.8651	18.520	SS	60.761
NDW07SB13	2005088.8284	231588.8651	18.520	SB	60.761
NDW07SS12	2005086.2228	231584.1098	15.489	SS	50.817
NDW07SB12	2005086.2228	231584.1098	15.489	SB	50.817
NDW07SS11	2005082.0002	231577.2839	11.249	SS	36.906
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NDW07SS21	2005361.0410	231406.5809	1.447	SS	4.747
NDW07MW07	2005304.3575	231370.2007	9.876	MW	32.401
NDW07SS17	2005025.1036	231641.4145	25.305	SS	83.021
NDW07SB17	2005025.1036	231641.4145	25.305	SB	83.021
NDW07MW06	2005323.9983	231462.3911	9.279	MW	30.443
NDW07MW06A	2005318.7675	231457.7330	9.403	MW	30.850
NDW07SD04	2005562.6557	231639.5762	-0.204	SD	-0.669
NDW07SD05	2005463.7283	231534.3847	0.838	SD	2.749

NAEVA GEOPHYSICS INC.
THE LEADER IN SUBSURFACE DETECTION
Subsurface Geophysical Surveys

GPR
MAGNETICS
ELECTROMAGNETICS
SEISMICS
RESISTIVITY
UTILITY LOCATION
UXO DETECTION
BOREHOLE CAMERA
STAFF SUPPORT

Results of Geophysical Investigation

SWMU 6, SWMU 7, and AOC J
Former NASD
Vieques Island, Puerto Rico

Dates of Investigation:

June 10, 16, and 24 - 27, 2003

Draft Submittal

July 25, 2002

PREPARED FOR:

CH2MHILL

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1 EXECUTIVE SUMMARY

NAEVA Geophysics Inc. was contracted to conduct geophysical investigations at three sites identified as SWMU 6, SWMU 7, and AOC J, located in the former NASD on Vieques Island, Puerto Rico (Figure 1). The purpose of these investigations was to delineate the lateral extent of buried waste resulting from historical dumping activities at each of the sites. The sites were investigated using a combination of grids and transect lines based on terrain conditions and site-specific objectives. Within grids, EM-31 data were collected at five-foot intervals along lines spaced 12.5 feet apart. Transect lines were spaced approximately 25 feet apart with data collection also occurring every five feet. NAEVA utilized Global Positioning System (GPS) equipment to survey the corners of grids and the endpoints of transect lines allowing the data to be reprojected from local coordinate systems to NAD 83 / UTM Zone 20N coordinates. The total areas of exploration at each site are as follows: approximately 0.25 acre at SWMU 6, 1.5 acres at SWMU 7, and 3 acres at AOC J.

After the completion of field work, the resultant data were processed and used to generate contour maps for interpretation. Data from the low-lying sites at SWMU 6 and AOC J were strongly influenced by the presence of a shallow, brackish to saline water table. The extreme values inherent in data collected in such an environment make accurate data interpretation more difficult. However, boundaries were able to be determined within each of the three areas. The data indicates that areas of fill material were completely enclosed with the exception of two small anomalous zones that seem to extend outside the mapped areas at SWMU 7 and AOC J, respectively.

2 INTRODUCTION

In accordance with CTO-248 for the Navy CLEAN II Prime Contract Number N62470-95-D-6007, NAEVA Geophysics, Inc. was contracted by CH2M HILL to perform geophysical surveys on three sites located on historical NASD property, Vieques Island, Puerto Rico. The objective of the geophysical investigation was to delineate the lateral extent of buried waste resulting from dumping activities at the sites. Fieldwork was conducted, as time permitted, between June 10 and 27, 2003.

Encompassing approximately 7,787 acres, the former NASD is located on the western end of the island of Vieques. The three sites identified for this investigation occur along its northern edge and each are separated by roughly one mile (Figure 1). The area of investigation (AOI) at each site was identified by CH2M HILL personnel along with the locations of known contamination and the extents of suspected waste burial. Each site required some level of brush clearing before geophysical investigations could begin. This task was performed by Timberline Environmental under the direction of CH2M HILL.

NAEVA Geophysics' approach for the investigation was to collect terrain conductivity measurements utilizing Geonics' EM-31. Following data collection, GPS equipment was employed to survey the borders of each of the AOIs. The resultant positional information was then used to reproject the local coordinate systems used during data collection into UTM coordinates, which in turn allowed the production of georeferenced contour maps.

3 INSTRUMENTATION

A Geonics EM-31 DL terrain conductivity meter was employed to perform the geophysical investigation while the use of an Ashtech Z-FX Surveyor GPS system provided survey control for the investigated areas.

3.1 Geonics EM-31 DL (Electromagnetics)

The EM-31 consists of boom-mounted coplanar electromagnetic transmitter and receiver coils that are mounted at a fixed distance of 12 feet. Data is collected and stored in a digital data recorder attached to the instrument. A current applied to the transmitter coil produces a time-varying magnetic field, which induces small secondary currents within the earth. These currents generate a secondary magnetic field, which is detected along with the primary field by the receiver coil. The EM-31 was carried at a height of 3-feet and operated in the vertical dipole mode, where the greatest portion of the instrument response is affected by material in the 3 to 9-foot depth range. The maximum useful depth of exploration of the EM-31, according to the manufacturer, is approximately 18 feet.

The EM-31 measures two components of the induced magnetic field. The first is the quadrature-phase component, which is a measurement of the apparent terrain conductivity in milliSiemens per meter (mS/m). Quadrature data (commonly referred to as conductivity) is useful for delineating areas where terrain conductivity differs from the local background. Variations can be caused by subsurface features such as foundations of former buildings, accumulations of buried metal, some contaminant plumes, and also by the electromagnetic fields produced by buried utilities. Terrain conductivity is a function of porosity, conductivity of included soil moisture, degree of saturation, and subsurface material. The ability to detect subtle lateral changes in conductivity makes EM-31 data very useful in mapping the subsurface conditions across a site.

The second component of the EM-31 is the in-phase, which is a measurement of the ratio between the induced magnetic field and the earth's magnetic field expressed in parts per thousand (ppt). The in-phase component is more sensitive to metallic objects than the quadrature-phase; therefore, it can be useful in the detection of buried metallic waste. A negative response by the in-phase component is usually an indication of buried metal. It should be noted that the relatively large coil separation of the EM-31 gives the in-phase component a low susceptibility to discreet metallic items or small concentrations of metal.

3.2 Ashtech Z-FX Surveyor RTK (Real Time Kinematic) GPS system

The Ashtech Z-FX Surveyor is a Real Time Kinematic (RTK) GPS system consisting of a mobile GPS antenna and a base station also utilizing an Ashtech Z-FX receiver. A base station was established at each AOI using existing monitoring wells whose surveyed coordinates were provided by CH2M HILL. Base station locations are shown on the individual contour maps for each site. Real time corrections were broadcast to the roving GPS unit via a radio link utilizing pacific crest radio modems. This system provides positional updates at a rate of 1 Hz, with an accuracy of 3 cm horizontal.

4 SURVEY DESIGN / METHODS

In order to accurately determine the boundaries of buried waste, it is imperative that the survey extend far enough away from the fill material to recognize a difference in its geophysical properties as compared to the surrounding undisturbed terrain. In practical terms, this means that each AOI should extend 20-30 feet beyond the limits of buried waste. At the three investigated sites, the need for complete data coverage was mitigated by the existing ground cover and terrain conditions. Discussions between CH2M HILL and NAEVA personnel resulted in the conclusion that the best way to meet the needs of this project would be through the use of both transect lines and grid systems for data collection.

Once a survey design had been selected, the same procedures were followed at each site to assess the quality of the geophysical instrumentation. Before any survey data were collected, the EM-31 was calibrated to the manufacturer's standards and a static test was performed to evaluate the quality of the data. A relatively "clean" (free of subsurface metal) area was identified for this test. The geophysical data were reviewed for the consistency of readings in order to confirm that the instrument was operating properly, and that no electromagnetic interference was present. Additionally, data collected along at least one survey line was repeated to evaluate the consistency of the instrument's performance.

4.1 SWMU 6

The westernmost of the three sites, SWMU 6 is located in a flat, swampy area only slightly above sea-level. Ground cover at the site is composed primarily of moderately-dense mangrove trees. Numerous small debris piles (10-15 feet in diameter, 2-3 feet high) consisting of both metallic and non-metallic materials are readily visible at the surface within SWMU 6. Upon arrival at the site, NAEVA's field team was informed that a previous geophysical survey provided CH2M HILL with what it considers to be accurate boundaries with the exception of the eastern edge of the buried waste.

With only one boundary to find, and in an effort to cause minimal disturbance to the mangrove trees, transect lines were selected as the most appropriate methodology at SWMU 6. Brush was cleared along five approximately parallel, east-west lines spaced 25 feet apart. The western ends of the lines were established such that they were certain to be within the buried waste. In the easting direction, the lines were extended as far as natural barriers (thicker brush or deep standing water) would allow. NAEVA utilized tape measures and temporary pin flags to establish coordinates along each line allowing the collection of EM-31 data at five-foot intervals. Image 1 illustrates data collection along a typical transect line at SWMU 6.

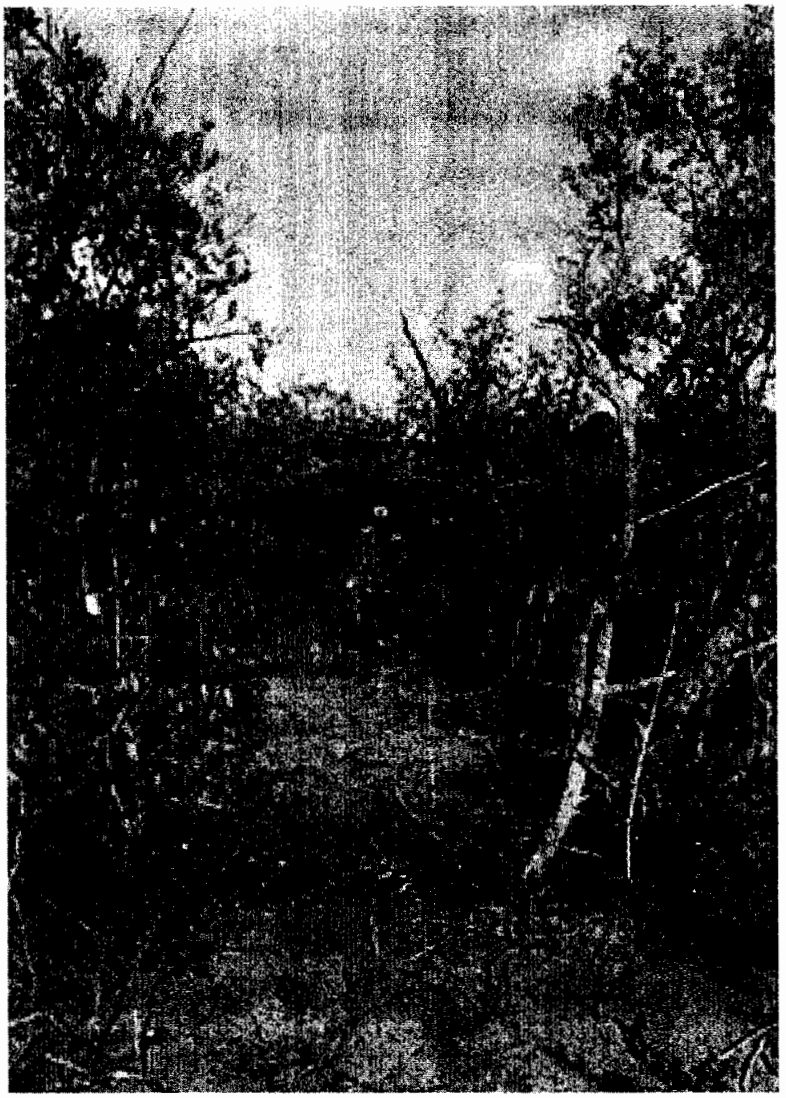


Image 1: EM-31 Data Collection at SWMU 6, Photo Looking to the West

4.2 SWMU 7

East of the other two sites, SWMU 7 is located at the highest elevation. Dense jungle foliage provides the ground cover at the site and its boundaries are defined by a two-track road on the east and a deep quebrada on the west. Surface debris at the site is visible along the east side of the quebrada, generally starting to its east and continuing down the slope to the bottom. No foreign materials were observed on the quebrada's west bank.

The steepness of its banks precluded the use of mechanical brush cutting equipment within the quebrada itself. To provide the best definition of the limits of subsurface contamination, the decision was made to construct a grid on the level ground between the road and the quebrada and to use transects to investigate the east bank and part of the west bank. The grid consisted of parallel lines space 12.5 feet apart and the transects were placed along those sections of the bank that could be navigated by foot. Data along both transect and grid lines were collected at five-foot intervals.

4.3 AOC J

AOC J is located between the other two sites and is dominated by a quebrada 20-30 feet wide and 5-10 feet deep bisecting the site south to north. A dense jungle canopy provides ground cover on both sides of the quebrada. Mounded debris is visible along the quebrada's west bank, near the northern edge of the site. A flat-lying debris field was also identified due west of the mounds. Both locations seemed to contain primarily metallic debris. The goal of the geophysical investigation at AOC J was to fully delineate the extents of contamination on the west side of the quebrada and to evaluate the presence of subsurface debris on the east side.

A combination of transect lines and grids was decided upon as the optimal method of investigation at this site. Using mechanical brush-cutting equipment, the west side of the quebrada was completely cleared over an area of approximately 1.5 acres. NAEVA then used tape measures and temporary pin flags to establish a grid of parallel lines spaced 12.5 feet apart along which data would be collected at five-foot intervals. Transect lines were cut from the west bank of the quebrada across it and into the jungle to the east. Eastern endpoints for the lines were established at distances believed to be sufficient to be free of subsurface contamination. A total of 10 lines were measured and marked using pin flags to allow data collection at five-foot intervals. The first seven lines extended across the quebrada to the west bank. Geophysical measurements within the quebrada itself were collected using a one-person rubber raft with pre-marked ropes stretched across the water. (Image 2) The ropes provided a means of accurately positioning the boat in a straight line and at the proper interval.

Image 2: Data Collection Within the Quebrada at AOC J, Photo Looking to the West

5 DATA PROCESSING

The geophysical data were temporarily stored in the instrument's data logger and then downloaded into a laptop computer for on-site review and editing. Golden's Surfer software was used to generate preliminary contour and posted values maps for field review of all geophysical data. These maps were then used to aid in evaluating the spatial coverage of the targeted features.

Upon completion of the field work, geophysical data were transferred to a desktop computer for final processing in Geosoft's Oasis Montaj software. Contour maps were first created using the local coordinate systems at each site. The positional data (in WGS 84 Geodetic Coordinates) were then interpolated for the EM-31 readings. Finally the coordinates were converted to NAD 83 UTM Zone 20N in meters.

Geophysical data processing includes the following steps:

- Instrument drift correction (leveling);
- Lag correction;
- Digital filtering and enhancement (if necessary);
- Gridding of data;
- Preparation of final geophysical maps.

6 RESULTS

Following data collection and the production of preliminary contour maps, the data were analyzed for the presence of anomalous features indicative of subsurface debris. Both conductivity and in-phase data were examined to provide the most complete understanding of subsurface conditions at each of the sites.

6.1 SWMU 6

The AOI at SWMU 6 is located at or slightly above sea level. This location results in the presence of brackish to saline standing water at or near the surface throughout the site. Saline groundwater is known to produce elevated conductivity values such as those observed at SWMU 6 (345-550 mS/m). Despite the unusually high range of values, a careful analysis of trends within the data should provide useful information regarding subsurface conditions.

Terrain conductivity values at SWMU 6 are generally highest in the north, where groundwater is the shallowest and where larger amounts of debris are visible at the surface. Instability in the data, usually an indication of foreign material in the subsurface, generally corresponds to locations where debris is visible at the surface. The exception to this is along Line 5 where readings are relatively stable along the line's entire length. (Figure 2)

Like the quadrature-phase data, in-phase data is affected by the conductivity of subsurface materials. With regard to SWMU 6, the extreme elevation in the conductivity results in in-phase readings that reach the limits of the EM31's relatively narrow range. In-phase values never decrease far enough to reflect lateral changes over the site, making the data uninterpretable. (Figure 3)

6.2 SWMU 7

Located at a higher elevation than either of the other two sites, SWMU 7 also exhibits the lowest conductivity values of the three. Overall, the data shows increasing conductivity to the southwest as the land slopes down steeply to the bottom of the quebrada. Highly variable, unstable values can be found near the center of the survey area, corresponding to locations of mapped surface debris. This area of response seems to continue beyond the surface debris and past the road marking the site boundary. (Figure 4)

In-phase data at SWMU 7 shows significant response only the central portion of the survey area. Like the conductivity response, anomalous features in the in-phase appear to correspond primarily to mapped surface debris, but also seem to continue northeast of the road. Greater in-phase response in the northwest is likely due primarily to topographic changes. (Figure 5)

Image 3: EM-31 Data Collection at SWMU 7, Photo Looking to the Northwest

6.3 AOC J

The ground surface at AOC J is slightly elevated as compared to SWMU 6, but is still close enough to sea level to produce higher than normal conductivity values. The dominant trends in the conductivity data are a general increase in response to the north as the water table nears the surface and extremely elevated response in the area of the quebrada, where brackish to saline water stands at the surface. Disregarding these larger trends, a few smaller-scale anomalies are also visible. An area of anomalously low conductivity can be identified near the northern edge of the grid area. The feature partially corresponds to the location of surface debris and continues to the northwest, away from the visible material. A second feature, appearing as a dipolar anomaly, appears at approximately 2005170N + 230000E and corresponds to surface debris piled along the quebrada's western bank. Nothing that would be termed a significant anomalous feature is observed in the transect line data. (Figure 6)

In-phase data at AOC J shows a strong correlation to the conductivity data, specifically that response seems to be inversely proportional to the depth to saline groundwater. Areas of anomalous response occur in similar locations to those noted in the conductivity data. In-phase measurements also do not indicate the presence of any significant sources of response east of the quebrada. (Figure 7)

Image 3: AOC J Grid Area, Photo Looking to the Southwest

7 CONCLUSIONS

The goal of this geophysical investigation was to locate the boundaries of buried material in the subsurface within each of three sites. Data sets at each site were analyzed independently in an attempt to draw conclusions about the nature of subsurface material.

7.1 SWMU 6

Geophysical response in both the conductivity and in-phase data at SWMU 6 are dominated by the near-surface, saline water table. Despite the difficulties caused by the extreme responses at this site, correlation with documented surface material allows data interpretation with regard to subsurface material. Unstable conductivity measurements, usually associated with the presence of buried debris, can be found in areas exhibiting surface debris, especially

in Lines 1 and 3. Line 5 exhibits relatively constant response along its entire length indicating that observed debris may be only surficial in nature.

Interpreted boundaries for fill material are indicated on Figures 2 and 3. Results of previous investigations suggest that usable in-phase data may have allowed a further refinement of this boundary. Lacking this information, the selected edge is necessarily conservative in nature and represents the maximum possible eastern extent of contamination.

7.2 SWMU 7

Due to the greater elevation at SWMU 7, the response to groundwater appears to be greatly reduced as compared to the other two sites. The only area in which response is dominated by topography appears to be in the northwest, at the bottom of the quebrada. This conclusion is supported by the fact that both in-phase and conductivity data in this location exhibit more stability than would be expected over areas of buried debris. Elevated conductivity measurements in the northeast and southwest of the survey area are believed to be the result of natural subsurface variation as neither feature is mirrored in the in-phase data.

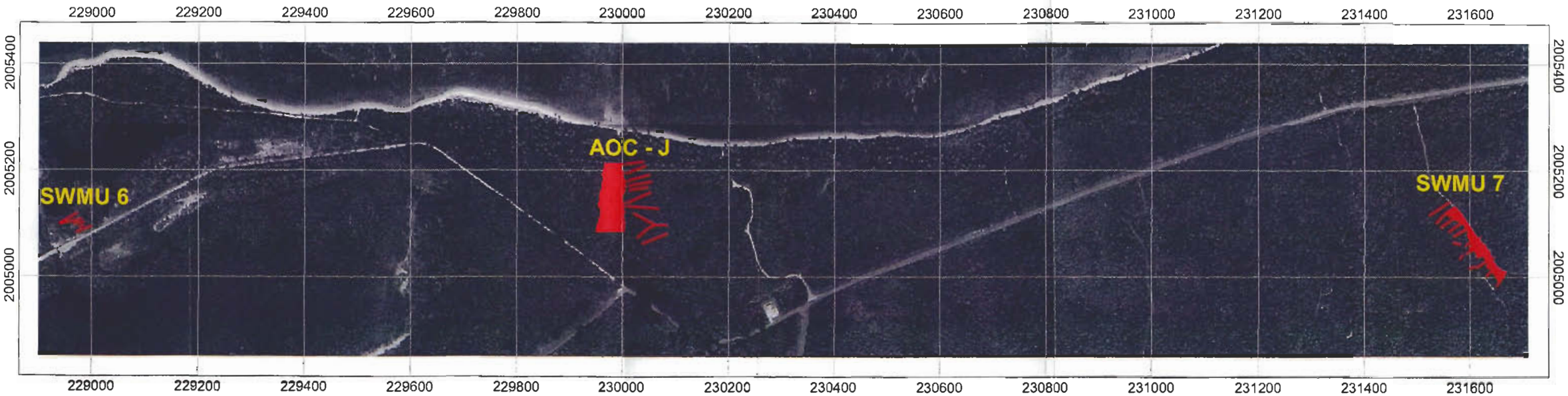
The interpreted fill boundary at SWMU 7 is based upon analysis of the data as well as location of mapped surface debris. The boundary appears to be enclosed on all side with the exception of a small lobe in the southeast. Both conductivity and in-phase data indicate that some buried material extends across the road and beyond the limits of the AOI. Data collected along the transects in the southwest do not indicate that any debris extends westward of the bottom of the quebrada.

7.3 AOC J

Both conductivity and in-phase data at AOC J show a strong influence from the area's relatively shallow, saline water table. Along the central quebrada, which contains surface water, the data becomes particularly difficult to interpret. One clear location of anomalous response can be found in the north central portion of the grid area. The response is centered on an area of mapped surface debris and extends away from to the northwest and seems to

continue beyond the survey area. Response to the debris piles along the west bank of the quebrada is less distinct. This is due in part to the influence of the quebrada itself, but also seems to indicate that the piles are relatively small and shallow. Nothing in the data collected on the transects indicates that subsurface debris extends beyond the quebrada's western bank.

Figures



Legend

Area of Investigation

NAEVA GEOPHYSICS INC.
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Scale 1:7500

100 0 100 200 300 400 500

metres

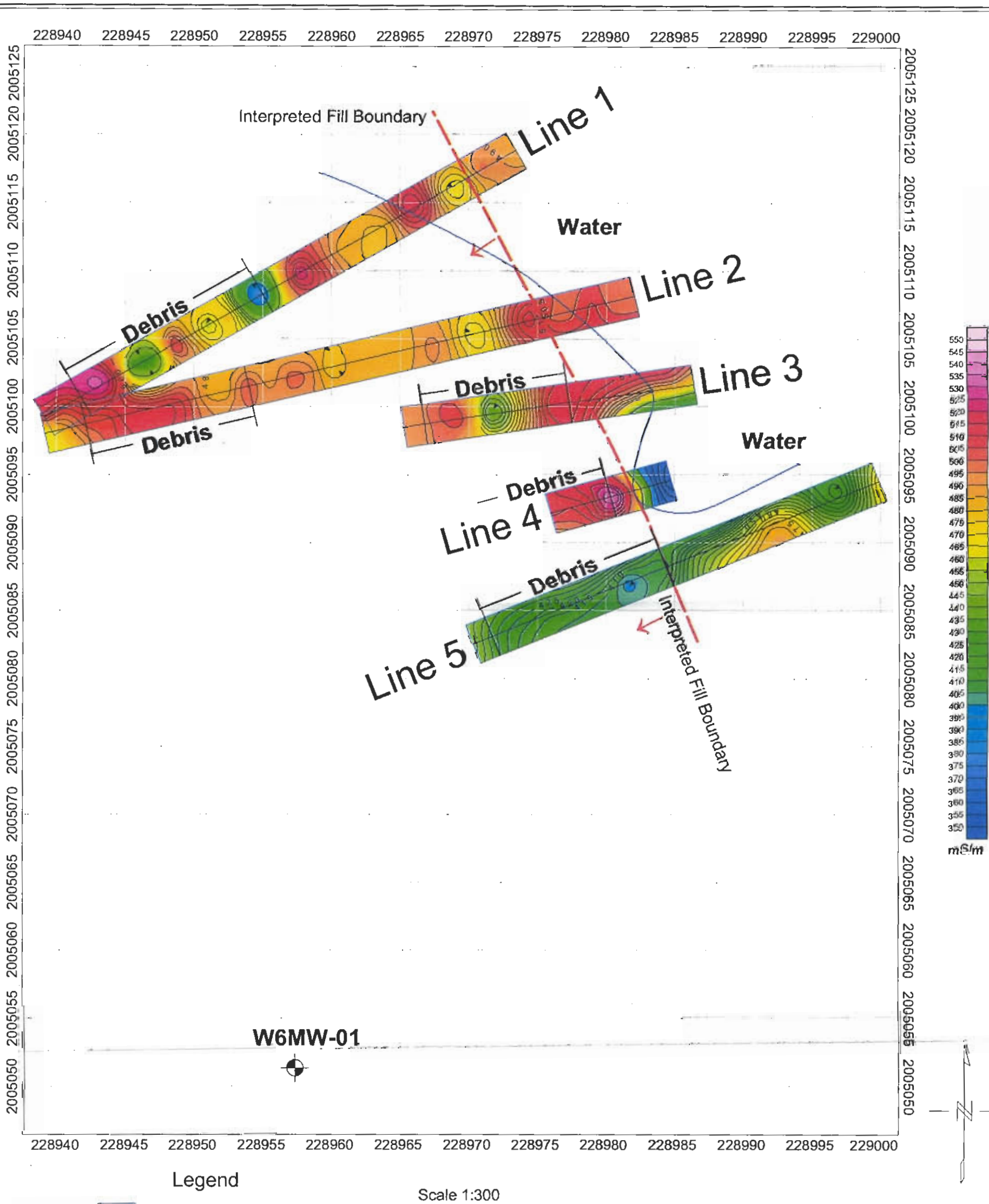
NAD83 / UTM zone 20N

Figure 1

CH2M HILL

EM-31 Investigation Locations
SWMU 6, SWMU 7, & AOC-J
Grid & Transect Areas
Vieques, Puerto Rico

Date(s) of Survey: June 10, 24, 25 & 26 2003



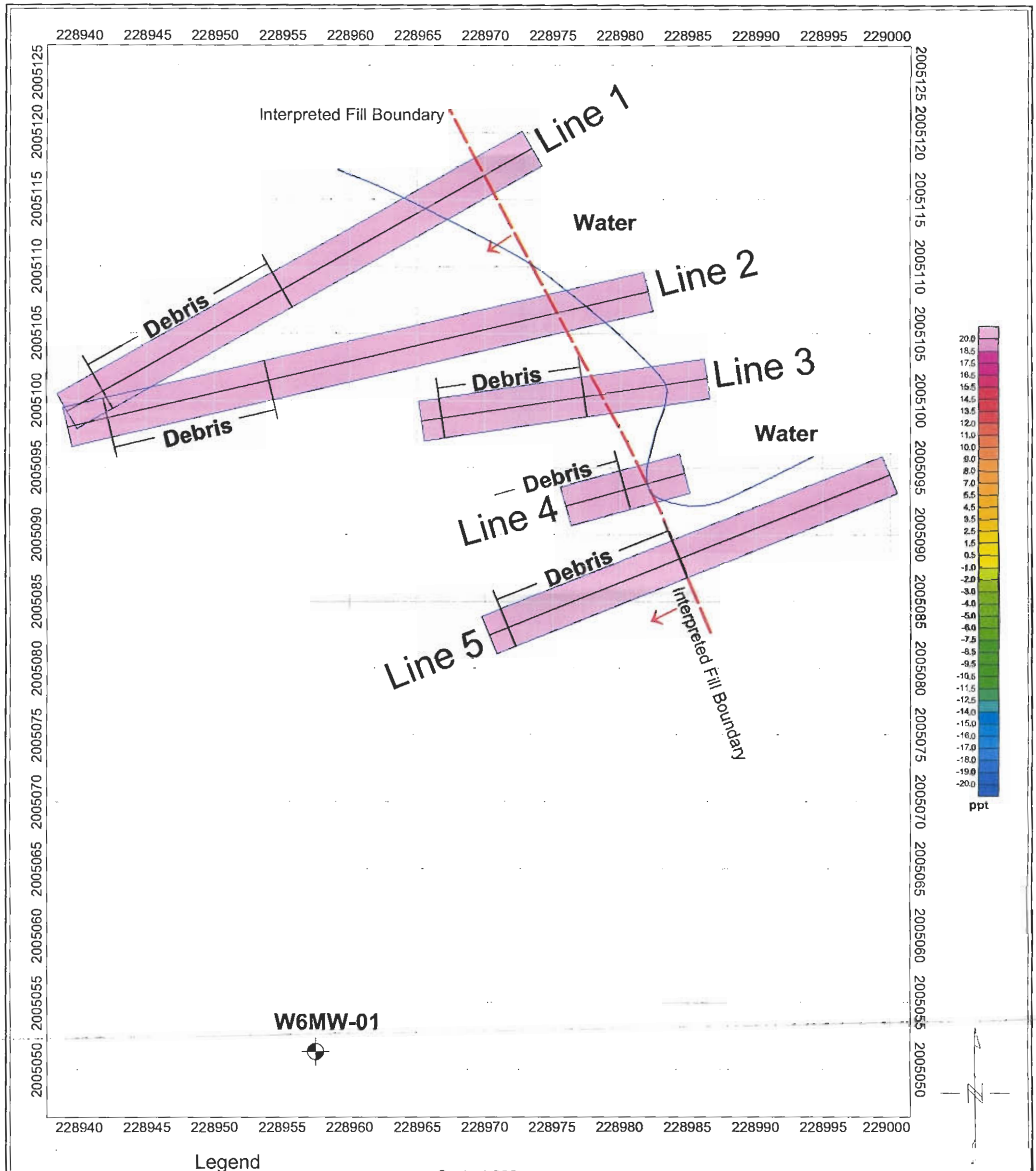
NAEVA GEOPHYSICS INC.
THE LEADER IN SUBSURFACE DETECTION
Subsurface Geophysical Surveys

Figure 2

CH2M HILL

EM-31 Terrain Conductivity
SWMU 6
Transect Area
Vieques, Puerto Rico

Date(s) of Survey: June 24, 2003



Legend

Area of Investigation

Monitor Well

Scale 1:300

5 0 5 10

metres

NAD83 / UTM zone 20N

NAEVA GEOPHYSICS INC.

THE LEADER IN SUBSURFACE DETECTION

Subsurface Geophysical Surveys

Figure 3

CH2M HILL
EM-31 Inphase SWMU 6 Transect Area **Vieques, Puerto Rico**
Date(s) of Survey: June 24, 2003

Surface Soil

Analytical Data Summary

	StationID	W6-SB06		W6-SB07		W6-SB08		W6-SB01	
	SampleID	NDA113		NDA115		NDA117		NDA101	
	Date Collected	04/20/00		04/20/00		04/20/00		04/24/00	
	SampleType	N		N		N		N	
Parameter	Units								
1,3-Dinitrobenzene	ug/Kg	303	U	285	U	310	U	336	U
2,4-Dinitrotoluene	ug/Kg	303	U	285	U	310	U	336	U
2,6-Dinitrotoluene	ug/Kg	303	U	285	U	310	U	336	U
Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine	ug/Kg	303	U	285	U	310	U	336	U
2-Nitrotoluene	ug/Kg	303	U	285	U	310	U	336	U
3-Nitrotoluene	ug/Kg	303	U	285	U	310	U	336	U
4-Nitrotoluene	ug/Kg	303	U	285	U	310	U	336	U
Nitrobenzene	ug/Kg	303	U	285	U	310	U	336	U
Hexahydro-1,3,5-trinitro-1,3,5,7-tetrazocine	ug/Kg	303	U	285	U	310	U	336	U
Tetryl	ug/Kg	303	U	285	U	310	U	336	U
1,3,5-Trinitrobenzene	ug/Kg	303	U	285	U	310	U	336	U
2,4,6-trinitrotoluene	ug/Kg	303	U	285	U	310	U	336	U

Analytical Data Summary

	StationID	W6-SB02		W6-SB02		W6-SB03		W6-SB04	
	SampleID	NDA103		NDA104FD1		NDA107		NDA109	
	Date Collected	04/24/00		04/24/00		04/24/00		04/24/00	
	SampleType	N		FD		N		N	
Parameter	Units								
1,3-Dinitrobenzene	ug/Kg	342	U	355	R	309	U	326	U
2,4-Dinitrotoluene	ug/Kg	342	U	355	R	309	U	326	U
2,6-Dinitrotoluene	ug/Kg	342	U	355	R	309	U	326	U
Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine	ug/Kg	342	U	355	R	309	U	326	U
2-Nitrotoluene	ug/Kg	342	U	355	R	309	U	326	U
3-Nitrotoluene	ug/Kg	342	U	355	R	309	U	326	U
4-Nitrotoluene	ug/Kg	342	U	355	R	309	U	326	U
Nitrobenzene	ug/Kg	342	U	355	R	309	U	326	U
Hexahydro-1,3,5-trinitro-1,3,5,7-tetrazocine	ug/Kg	342	U	355	R	309	U	326	U
Tetryl	ug/Kg	342	U	355	R	309	U	326	U
1,3,5-Trinitrobenzene	ug/Kg	342	U	355	R	309	U	326	U
2,4,6-trinitrotoluene	ug/Kg	342	U	355	R	309	U	326	U

Analytical Data Summary

	StationID	W6-SB05		NDW06SS09		NDW06SS09		NDW06SS10	
	SampleID	NDA111		NDW06FD04P-R01		NDW06SS09-R01		NDW06SS10-R01	
	Date Collected	04/24/00		08/28/03		08/28/03		08/28/03	
	SampleType	N		FD		N		N	
Parameter	Units								
1,3-Dinitrobenzene	ug/Kg	332	U	163	U	166	U	165	U
2,4-Dinitrotoluene	ug/Kg	332	U	163	U	166	U	165	U
2,6-Dinitrotoluene	ug/Kg	332	U	163	U	166	U	165	U
Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine	ug/Kg	332	U	163	U	166	U	165	U
2-Nitrotoluene	ug/Kg	332	U	163	U	166	U	165	U
3-Nitrotoluene	ug/Kg	332	U	163	U	166	U	165	U
4-Nitrotoluene	ug/Kg	332	U	163	U	166	U	165	U
Nitrobenzene	ug/Kg	332	U	163	U	166	U	165	U
Hexahydro-1,3,5-trinitro-1,3,5,7-tetrazocine	ug/Kg	332	U	163	U	166	U	165	U
Tetryl	ug/Kg	332	U	163	UJ	166	UJ	165	UJ
1,3,5-Trinitrobenzene	ug/Kg	332	U	163	U	166	U	165	U
2,4,6-trinitrotoluene	ug/Kg	332	U	163	U	166	U	165	U

Analytical Data Summary

	StationID	NDW06SS11		NDW06SS12		NDW06SS13		NDW06SS14	
	SampleID	NDW06SS11-R01		NDW06SS12-R01		NDW06SS13-R01		NDW06SS14-R01	
	Date Collected	08/28/03		08/28/03		08/28/03		08/28/03	
	SampleType	N		N		N		N	
Parameter	Units								
1,3-Dinitrobenzene	ug/Kg	164	U	182	U	159	U	218	U
2,4-Dinitrotoluene	ug/Kg	164	U	182	U	159	U	218	U
2,6-Dinitrotoluene	ug/Kg	164	U	182	U	159	U	218	U
Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine	ug/Kg	164	U	182	U	159	U	218	U
2-Nitrotoluene	ug/Kg	164	U	182	U	159	U	218	U
3-Nitrotoluene	ug/Kg	164	U	182	U	159	U	218	U
4-Nitrotoluene	ug/Kg	164	U	182	U	159	U	218	U
Nitrobenzene	ug/Kg	164	U	182	U	159	U	218	U
Hexahydro-1,3,5-trinitro-1,3,5,7-tetrazocine	ug/Kg	164	U	182	U	159	U	218	U
Tetryl	ug/Kg	164	UJ	182	UJ	159	UJ	218	UJ
1,3,5-Trinitrobenzene	ug/Kg	164	U	182	U	159	U	218	U
2,4,6-trinitrotoluene	ug/Kg	164	U	182	U	159	U	218	U

Analytical Data Summary

	StationID	NDW06SS15		NDW06SS16		NDW06SS17		NDW06SS18	
	SampleID	NDW06SS15-R01		NDW06SS16-R01		NDW06SS17-R01		NDW06SS18-R01	
	Date Collected	08/28/03		08/28/03		08/28/03		08/28/03	
	SampleType	N		N		N		N	
Parameter	Units								
1,3-Dinitrobenzene	ug/Kg	230	U	218	U	208	U	215	U
2,4-Dinitrotoluene	ug/Kg	230	U	218	U	208	U	215	U
2,6-Dinitrotoluene	ug/Kg	230	U	218	U	208	U	215	U
Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine	ug/Kg	230	U	218	U	208	U	215	U
2-Nitrotoluene	ug/Kg	230	U	218	U	208	U	215	U
3-Nitrotoluene	ug/Kg	230	U	218	U	208	U	215	U
4-Nitrotoluene	ug/Kg	230	U	218	U	208	U	215	U
Nitrobenzene	ug/Kg	230	U	218	U	208	U	215	U
Hexahydro-1,3,5-trinitro-1,3,5,7-tetrazocine	ug/Kg	230	U	218	U	208	U	215	U
Tetryl	ug/Kg	230	UJ	218	UJ	208	UJ	215	UJ
1,3,5-Trinitrobenzene	ug/Kg	230	U	218	U	208	U	215	U
2,4,6-trinitrotoluene	ug/Kg	230	U	218	U	208	U	215	U

Analytical Data Summary

	StationID	NDW06SS19		NDW06SS20		NDW06SS21		NDW06SS22	
	SampleID	NDW06SS19-R01		NDW06SS20-R01		NDW06SS21-R01		NDW06SS22-R01	
	Date Collected	08/28/03		08/28/03		08/28/03		08/28/03	
	SampleType	N		N		N		N	
Parameter	Units								
1,3-Dinitrobenzene	ug/Kg	211	U	180	U	166	U	164	U
2,4-Dinitrotoluene	ug/Kg	211	U	180	U	166	U	164	U
2,6-Dinitrotoluene	ug/Kg	211	U	180	U	166	U	164	U
Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine	ug/Kg	211	U	180	U	166	U	164	U
2-Nitrotoluene	ug/Kg	211	U	180	U	166	U	164	U
3-Nitrotoluene	ug/Kg	211	U	180	U	166	U	164	U
4-Nitrotoluene	ug/Kg	211	U	180	U	166	U	164	U
Nitrobenzene	ug/Kg	211	U	180	U	166	U	164	U
Hexahydro-1,3,5-trinitro-1,3,5,7-tetrazocine	ug/Kg	211	U	180	U	166	U	164	U
Tetryl	ug/Kg	211	UJ	180	UJ	166	UJ	164	UJ
1,3,5-Trinitrobenzene	ug/Kg	211	U	180	U	166	U	164	U
2,4,6-trinitrotoluene	ug/Kg	211	U	180	U	166	U	164	U

Analytical Data Summary

	StationID	NDW06SS23	
	SampleID	NDW06SS23-R01	
	Date Collected	08/28/03	
	SampleType	N	
Parameter	Units		
1,3-Dinitrobenzene	ug/Kg	167	U
2,4-Dinitrotoluene	ug/Kg	167	U
2,6-Dinitrotoluene	ug/Kg	167	U
Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine	ug/Kg	167	U
2-Nitrotoluene	ug/Kg	167	U
3-Nitrotoluene	ug/Kg	167	U
4-Nitrotoluene	ug/Kg	167	U
Nitrobenzene	ug/Kg	167	U
Hexahydro-1,3,5-trinitro-1,3,5,7-tetrazocine	ug/Kg	167	U
Tetryl	ug/Kg	167	UJ
1,3,5-Trinitrobenzene	ug/Kg	167	U
2,4,6-trinitrotoluene	ug/Kg	167	U

Analytical Data Summary

	StationID	W6-SB06		W6-SB07		W6-SB08		W6-SB01		W6-SB02	
	SampleID	NDA113		NDA115		NDA117		NDA101		NDA103	
	Date Collected	04/20/00		04/20/00		04/20/00		04/24/00		04/24/00	
	SampleType	N		N		N		N		N	
Parameter	**Units**										
Aluminum	mg/Kg	14000	=	11100	=	12200	=	5170	=	4900	=
Antimony	mg/Kg	0.74	J	0.34	J	0.46	J	13.3	J	0.19	UJ
Arsenic	mg/Kg	1	J	1.1	J	0.99	J	7.6	=	1.9	J
Barium	mg/Kg	29.5	J	28.8	J	37.6	J	19.3	J	12.8	J
Beryllium	mg/Kg	0.12	J	0.11	J	0.11	J	0.041	U	0.042	U
Cadmium	mg/Kg	0.025	U	0.023	U	0.23	J	0.33	J	0.35	J
Calcium	mg/Kg	35400	J	68800	J	69700	J	105000	J	162000	J
Chromium, Total	mg/Kg	42.9	=	35.7	=	23.3	=	28	=	6.4	=
Cobalt	mg/Kg	12.8	=	11.5	=	9.1	J	6	J	2.4	J
Copper	mg/Kg	114	J	52.3	J	114	J	121	=	16.1	=
Iron	mg/Kg	22900	=	16900	=	18500	=	80000	=	8920	=
Lead	mg/Kg	36.1	=	3.9	=	25.8	=	617	=	17.5	=
Magnesium	mg/Kg	9050	=	6600	=	7630	=	5180	=	4180	=
Manganese	mg/Kg	465	J	390	J	379	J	415	=	128	=
Mercury	mg/Kg	0.014	U	0.013	U	0.016	U	0.081	J	0.015	UJ
Nickel	mg/Kg	20	=	16.5	=	10.7	=	13	=	2.4	J
Potassium	mg/Kg	1460	=	1570	=	2440	=	1740	J	1900	J
Selenium	mg/Kg	0.26	U	0.24	U	0.26	U	0.28	U	0.29	U
Silver	mg/Kg	0.41	J	0.057	U	0.13	J	0.36	J	0.069	U
Sodium	mg/Kg	3250	=	4700	=	4040	=	12100	=	13700	=
Thallium	mg/Kg	0.34	U	0.31	U	0.34	U	4.3	=	0.37	U
Vanadium	mg/Kg	66	=	51.2	=	51	=	23.2	=	19.9	=
Zinc	mg/Kg	96.5	=	29.5	=	83.7	=	438	=	42	=

Analytical Data Summary

	StationID	W6-SB02		W6-SB03		W6-SB04		W6-SB05		NDW06SS09	
	SampleID	NDA104FD1		NDA107		NDA109		NDA111		NDW06FD04P-R01	
	Date Collected	04/24/00		04/24/00		04/24/00		04/24/00		08/28/03	
	SampleType	FD		N		N		N		FD	
Parameter	Units										
Aluminum	mg/Kg	5640	=	5810	=	10900	=	11600	=	3750	=
Antimony	mg/Kg	0.24	J	1	J	0.47	J	0.82	J	0.861	J
Arsenic	mg/Kg	2.4	J	1.6	J	0.93	J	1.5	J	1.14	J
Barium	mg/Kg	12.9	J	26.5	J	36.1	J	18.2	J	16.4	J
Beryllium	mg/Kg	0.043	U	0.054	J	0.12	J	0.069	J	0.0352	J
Cadmium	mg/Kg	0.33	J	0.028	J	1.4	=	0.61	J	0.0982	J
Calcium	mg/Kg	163000	J	111000	J	77800	J	119000	J	137000	=
Chromium, Total	mg/Kg	8.2	=	12.9	=	14.3	=	14.9	=	5.18	=
Cobalt	mg/Kg	2.9	J	4	J	8.9	J	3.3	J	1.63	J
Copper	mg/Kg	22.2	=	38.7	=	36.8	=	250	=	10.1	=
Iron	mg/Kg	10800	=	16000	=	20600	=	16100	=	6090	J
Lead	mg/Kg	27.9	=	104	=	22.5	=	67.5	=	11.3	=
Magnesium	mg/Kg	4610	=	3800	=	6870	=	5750	=	3110	J
Manganese	mg/Kg	117	=	276	=	331	=	137	=	137	=
Mercury	mg/Kg	0.019	UJ	0.081	J	0.019	UJ	0.038	J	0.0132	J
Nickel	mg/Kg	3.1	J	4.4	J	9.2	J	4	J	2.14	J
Potassium	mg/Kg	2300	J	1820	J	2700	J	2610	J	1780	J
Selenium	mg/Kg	0.3	U	0.26	U	0.28	U	0.28	U	0.287	U
Silver	mg/Kg	0.072	U	0.14	J	0.099	J	0.12	J	0.0347	U
Sodium	mg/Kg	16700	=	6300	=	5390	=	14200	=	10500	=
Thallium	mg/Kg	0.39	U	0.34	U	0.77	J	0.82	J	0.176	U
Vanadium	mg/Kg	22.9	=	27.7	=	65.8	=	26.5	=	13.3	=
Zinc	mg/Kg	59.8	=	82.2	=	86.3	=	138	=	125	J

Analytical Data Summary

	StationID	NDW06SS09		NDW06SS10		NDW06SS11		NDW06SS12		NDW06SS13	
	SampleID	NDW06SS09-R01		NDW06SS10-R01		NDW06SS11-R01		NDW06SS12-R01		NDW06SS13-R01	
	Date Collected	08/28/03		08/28/03		08/28/03		08/28/03		08/28/03	
	SampleType	N		N		N		N		N	
Parameter	Units										
Aluminum	mg/Kg	3980	=	3470	=	3600	=	4670	=	5400	=
Antimony	mg/Kg	0.606	J	0.465	J	0.468	J	0.862	J	2.96	J
Arsenic	mg/Kg	1.32	J	1.48	J	0.48	J	0.623	J	3.09	J
Barium	mg/Kg	16.5	J	15.5	J	8.52	J	9.28	J	34	J
Beryllium	mg/Kg	0.0362	J	0.0398	J	0.03	J	0.0437	J	0.0524	J
Cadmium	mg/Kg	0.0649	J	0.0165	U	0.0367	J	0.0783	J	0.471	J
Calcium	mg/Kg	133000	=	136000	=	123000	=	115000	=	98300	=
Chromium, Total	mg/Kg	5.18	=	5.48	=	3.07	=	5.3	=	12.7	=
Cobalt	mg/Kg	1.59	J	1.71	J	1.02	J	1.55	J	5.37	J
Copper	mg/Kg	9.68	=	9.83	=	5.21	J	12.3	=	275	=
Iron	mg/Kg	6390	J	6430	J	2960	=	4520	J	36800	J
Lead	mg/Kg	12.8	=	4.83	=	3.58	J	12	=	334	=
Magnesium	mg/Kg	3310	J	2790	J	1810	J	2270	J	3920	J
Manganese	mg/Kg	138	=	145	=	30.9	=	43.6	=	298	=
Mercury	mg/Kg	0.0121	J	0.00908	J	0.00846	J	0.0179	J	0.0472	=
Nickel	mg/Kg	1.85	J	2.48	J	1.1	J	2.07	J	9.35	J
Potassium	mg/Kg	1820	J	1320	J	1570	J	1720	J	1650	J
Selenium	mg/Kg	0.264	U	0.258	U	0.286	U	0.297	U	0.252	U
Silver	mg/Kg	0.0346	J	0.0313	U	0.0347	U	0.036	U	0.141	J
Sodium	mg/Kg	11100	=	5140	=	7150	=	7240	=	4500	=
Thallium	mg/Kg	0.162	U	0.158	U	0.175	U	0.182	U	0.154	U
Vanadium	mg/Kg	14.6	=	14	=	9.84	J	13.4	=	29.8	=
Zinc	mg/Kg	127	=	12.9	J	12.6	=	37.7	=	357	=

Analytical Data Summary

	StationID	NDW06SS14		NDW06SS15		NDW06SS16		NDW06SS17		NDW06SS18	
	SampleID	NDW06SS14-R01		NDW06SS15-R01		NDW06SS16-R01		NDW06SS17-R01		NDW06SS18-R01	
	Date Collected	08/28/03		08/28/03		08/28/03		08/28/03		08/28/03	
	SampleType	N		N		N		N		N	
Parameter	**Units**										
Aluminum	mg/Kg	6890	=	8240	=	9330	=	6880	=	6530	=
Antimony	mg/Kg	0.76	J	0.171	UJ	0.178	UJ	0.15	UJ	0.174	J
Arsenic	mg/Kg	1.12	J	0.912	J	1.17	J	0.598	J	0.635	J
Barium	mg/Kg	8.41	J	8.25	J	7.36	J	8.48	J	9.2	J
Beryllium	mg/Kg	0.0759	J	0.0968	J	0.111	J	0.0809	J	0.0735	J
Cadmium	mg/Kg	0.0944	J	0.0539	J	0.0445	J	0.0634	J	0.141	J
Calcium	mg/Kg	136000	=	73800	=	50200	=	48700	=	72100	=
Chromium, Total	mg/Kg	6.99	=	6.57	=	7.86	=	5.93	=	5.82	=
Cobalt	mg/Kg	2.42	J	2.35	J	2.87	J	2.25	J	1.88	J
Copper	mg/Kg	14.7	=	13.6	=	15.9	=	12.4	=	13.8	=
Iron	mg/Kg	7170	J	7970	J	8780	J	6820	J	6290	J
Lead	mg/Kg	10.3	=	5.92	=	6.83	=	5.64	=	12.1	=
Magnesium	mg/Kg	3110	J	3470	J	3690	J	2870	J	2730	J
Manganese	mg/Kg	53.9	=	57.7	=	58.4	=	49.7	=	49.3	=
Mercury	mg/Kg	0.0183	J	0.0216	J	0.0235	J	0.0159	J	0.0211	J
Nickel	mg/Kg	2.88	J	2.67	J	3.15	J	2.38	J	2.25	J
Potassium	mg/Kg	2320	J	2580	J	2890	J	2230	J	1970	J
Selenium	mg/Kg	0.435	J	0.358	U	0.391	J	0.314	U	0.298	U
Silver	mg/Kg	0.04	U	0.0433	U	0.0452	U	0.0381	U	0.0361	U
Sodium	mg/Kg	10300	=	12400	=	11800	=	9400	=	9450	=
Thallium	mg/Kg	0.202	U	0.219	U	0.228	U	0.192	U	0.182	U
Vanadium	mg/Kg	19.5	=	20.1	=	23.5	=	19.3	=	14.5	=
Zinc	mg/Kg	29.1	=	25.1	=	28.9	=	22.1	=	34.4	=

Analytical Data Summary

	StationID	NDW06SS19		NDW06SS20		NDW06SS21		NDW06SS22		NDW06SS23	
	SampleID	NDW06SS19-R01		NDW06SS20-R01		NDW06SS21-R01		NDW06SS22-R01		NDW06SS23-R01	
	Date Collected	08/28/03		08/28/03		08/28/03		08/28/03		08/28/03	
	SampleType	N		N		N		N		N	
Parameter	Units										
Aluminum	mg/Kg	5930	=	3510	=	10300	=	4430	=	4400	=
Antimony	mg/Kg	0.448	J	0.443	J	0.702	J	0.516	J	2.19	J
Arsenic	mg/Kg	1.01	J	0.566	J	0.765	J	0.963	J	7.9	J
Barium	mg/Kg	8.47	J	11.5	J	13	J	12.4	J	24.9	J
Beryllium	mg/Kg	0.0648	J	0.0468	J	0.0725	J	0.046	J	0.068	J
Cadmium	mg/Kg	0.47	J	0.048	J	0.0568	J	0.0729	J	0.767	J
Calcium	mg/Kg	70600	=	165000	=	64200	=	90700	=	85000	=
Chromium, Total	mg/Kg	6.67	=	4.1	=	16.7	=	5.71	=	25.8	=
Cobalt	mg/Kg	2.11	J	1.3	J	9.3	J	2.52	J	5.94	J
Copper	mg/Kg	41.9	=	7.54	=	29.9	=	20.5	=	86.7	=
Iron	mg/Kg	9260	J	3230	J	20400	J	5720	J	93200	=
Lead	mg/Kg	87.8	=	7.48	=	4.71	=	6.09	=	397	=
Magnesium	mg/Kg	2800	J	2670	J	7830	J	3690	J	2690	J
Manganese	mg/Kg	49.1	=	40.7	=	201	=	81.7	=	741	=
Mercury	mg/Kg	0.0194	J	0.00766	J	0.00337	J	0.0138	J	0.0578	=
Nickel	mg/Kg	2.9	J	1.34	J	10.3	J	2.43	J	12.3	J
Potassium	mg/Kg	1900	J	1620	J	2700	J	1450	J	1280	J
Selenium	mg/Kg	0.222	U	0.299	U	0.254	U	0.249	U	0.25	U
Silver	mg/Kg	0.0269	U	0.0363	U	0.0308	U	0.0301	U	0.262	J
Sodium	mg/Kg	9880	=	7730	=	5460	=	7750	=	4080	=
Thallium	mg/Kg	0.136	U	0.183	U	0.155	U	0.152	U	0.153	U
Vanadium	mg/Kg	18	=	10.5	J	71.4	=	18.7	=	19.7	=
Zinc	mg/Kg	99.1	=	18.1	=	34.4	=	27.3	=	389	=

Analytical Data Summary

	StationID	NDW06SS09		NDW06SS09		NDW06SS10		NDW06SS11		NDW06SS12	
	SampleID	NDW06FD04P-R01		NDW06SS09-R01		NDW06SS10-R01		NDW06SS11-R01		NDW06SS12-R01	
	Date Collected	08/28/03		08/28/03		08/28/03		08/28/03		08/28/03	
	SampleType	FD		N		N		N		N	
Parameter	Units										
Perchlorate	ug/Kg	130	U	129	U	134	U	135	U	145	U

Analytical Data Summary

	StationID	NDW06SS13		NDW06SS14		NDW06SS15		NDW06SS16		NDW06SS17	
	SampleID	NDW06SS13-R01		NDW06SS14-R01		NDW06SS15-R01		NDW06SS16-R01		NDW06SS17-R01	
	Date Collected	08/28/03		08/28/03		08/28/03		08/28/03		08/28/03	
	SampleType	N		N		N		N		N	
Parameter	Units										
Perchlorate	ug/Kg	126	U	170	U	190	U	191	U	188	U

Analytical Data Summary

	StationID	NDW06SS18		NDW06SS19		NDW06SS20		NDW06SS21		NDW06SS22	
	SampleID	NDW06SS18-R01		NDW06SS19-R01		NDW06SS20-R01		NDW06SS21-R01		NDW06SS22-R01	
	Date Collected	08/28/03		08/28/03		08/28/03		08/28/03		08/28/03	
	SampleType	N		N		N		N		N	
Parameter	Units										
Perchlorate	ug/Kg	178	U	160	U	138	U	128	U	128	U

Analytical Data Summary

	StationID	NDW06SS23	
	SampleID	NDW06SS23-R01	
	Date Collected	08/28/03	
	SampleType	N	
Parameter	Units		
Perchlorate	ug/Kg	134	U

Analytical Data Summary

	StationID	W6-SB06		W6-SB07		W6-SB08		W6-SB01		W6-SB02	
	SampleID										
	Date Collected	NDA113		NDA115		NDA117		NDA101		NDA103	
	SampleType	04/20/00		04/20/00		04/20/00		04/24/00		04/24/00	
Parameter	**Units**	N		N		N		N		N	
Aroclor-1016	ug/Kg	41	UJ	38	UJ	42	UJ	44	UJ	45	UJ
Aroclor-1221	ug/Kg	82	UJ	76	UJ	84	UJ	89	UJ	91	UJ
Aroclor-1232	ug/Kg	41	UJ	38	UJ	42	UJ	44	UJ	45	UJ
Aroclor-1242	ug/Kg	41	UJ	38	UJ	42	UJ	44	UJ	45	UJ
Aroclor-1248	ug/Kg	41	UJ	38	UJ	42	UJ	44	UJ	45	UJ
Aroclor-1254	ug/Kg	41	UJ	38	UJ	42	UJ	44	UJ	45	UJ
Aroclor-1260	ug/Kg	41	UJ	38	UJ	42	UJ	44	UJ	45	UJ

Analytical Data Summary

	StationID	W6-SB02		W6-SB03		W6-SB04		W6-SB05		NDW06SS09	
	SampleID	NDA104FD1		NDA107		NDA109		NDA111		NDW06FD04P-R01	
	Date Collected	04/24/00		04/24/00		04/24/00		04/24/00		08/28/03	
	SampleType	FD		N		N		N		FD	
Parameter	**Units**										
Aroclor-1016	ug/Kg	46	UJ	41	UJ	43	UJ	44	UJ	43	U
Aroclor-1221	ug/Kg	94	UJ	83	UJ	87	UJ	88	UJ	87	U
Aroclor-1232	ug/Kg	46	UJ	41	UJ	43	UJ	44	UJ	43	U
Aroclor-1242	ug/Kg	46	UJ	41	UJ	43	UJ	44	UJ	43	U
Aroclor-1248	ug/Kg	46	UJ	41	UJ	43	UJ	44	UJ	43	U
Aroclor-1254	ug/Kg	46	UJ	41	UJ	43	UJ	44	UJ	43	U
Aroclor-1260	ug/Kg	46	UJ	41	UJ	43	UJ	44	UJ	43	U

Analytical Data Summary

	StationID	NDW06SS09		NDW06SS10		NDW06SS11		NDW06SS12		NDW06SS13	
	SampleID										
	Date Collected	NDW06SS09-R01		NDW06SS10-R01		NDW06SS11-R01		NDW06SS12-R01		NDW06SS13-R01	
	SampleType	08/28/03		08/28/03		08/28/03		08/28/03		08/28/03	
Parameter	**Units**	N		N		N		N		N	
Aroclor-1016	ug/Kg	44	U	44	U	43	U	48	U	42	U
Aroclor-1221	ug/Kg	90	U	89	U	88	U	97	U	85	U
Aroclor-1232	ug/Kg	44	U	44	U	43	U	48	U	42	U
Aroclor-1242	ug/Kg	44	U	44	U	43	U	48	U	42	U
Aroclor-1248	ug/Kg	44	U	44	U	43	U	48	U	42	U
Aroclor-1254	ug/Kg	44	U	44	U	43	U	48	U	42	U
Aroclor-1260	ug/Kg	44	U	44	U	43	U	48	U	42	U

Analytical Data Summary

	StationID	NDW06SS14		NDW06SS15		NDW06SS16		NDW06SS17		NDW06SS18	
	SampleID										
	Date Collected	NDW06SS14-R01		NDW06SS15-R01		NDW06SS16-R01		NDW06SS17-R01		NDW06SS18-R01	
	SampleType	08/28/03		08/28/03		08/28/03		08/28/03		08/28/03	
Parameter	**Units**	N		N		N		N		N	
Aroclor-1016	ug/Kg	58	U	60	U	58	U	56	U	57	U
Aroclor-1221	ug/Kg	120	U	120	U	120	U	110	U	120	U
Aroclor-1232	ug/Kg	58	U	60	U	58	U	56	U	57	U
Aroclor-1242	ug/Kg	58	U	60	U	58	U	56	U	57	U
Aroclor-1248	ug/Kg	58	U	60	U	58	U	56	U	57	U
Aroclor-1254	ug/Kg	58	U	60	U	58	U	56	U	57	U
Aroclor-1260	ug/Kg	58	U	60	U	58	U	56	U	57	U

Analytical Data Summary

	StationID	NDW06SS19		NDW06SS20		NDW06SS21		NDW06SS22		NDW06SS23	
	SampleID										
	Date Collected	NDW06SS19-R01		NDW06SS20-R01		NDW06SS21-R01		NDW06SS22-R01		NDW06SS23-R01	
	SampleType	08/28/03		08/28/03		08/28/03		08/28/03		08/28/03	
Parameter	**Units**	N		N		N		N		N	
Aroclor-1016	ug/Kg	560	U	480	U	440	U	43	U	440	U
Aroclor-1221	ug/Kg	1100	U	970	U	880	U	88	U	890	U
Aroclor-1232	ug/Kg	560	U	480	U	440	U	43	U	440	U
Aroclor-1242	ug/Kg	560	U	480	U	440	U	43	U	440	U
Aroclor-1248	ug/Kg	560	U	480	U	440	U	43	U	440	U
Aroclor-1254	ug/Kg	560	U	480	U	440	U	43	U	43	J
Aroclor-1260	ug/Kg	560	U	480	U	440	U	43	U	440	U

Analytical Data Summary

	StationID	W6-SB06		W6-SB07		W6-SB08		W6-SB01	
	SampleID	NDA113		NDA115		NDA117		NDA101	
	Date Collected	04/20/00		04/20/00		04/20/00		04/24/00	
	SampleType	N		N		N		N	
Parameter	Units								
Aldrin	ug/Kg	2.1	UJ	1.9	UJ	2.1	UJ	2.3	UJ
Alpha bhc (alpha hexachlorocyclohexane)	ug/Kg	2.1	UJ	1.9	UJ	2.1	UJ	2.3	UJ
Beta bhc (beta hexachlorocyclohexane)	ug/Kg	2.1	UJ	1.9	UJ	2.1	UJ	2.3	UJ
Delta bhc (delta hexachlorocyclohexane)	ug/Kg	2.1	UJ	1.9	UJ	2.1	UJ	2.3	UJ
Gamma bhc (lindane)	ug/Kg	2.1	UJ	1.9	UJ	2.1	UJ	2.3	UJ
Alpha-chlordane	ug/Kg	0.61	J	1.9	UJ	2.1	UJ	2.3	UJ
Gamma-chlordane	ug/Kg	2.1	UJ	1.9	UJ	2.1	UJ	2.3	UJ
p,p'-DDD	ug/Kg	4.1	UJ	3.8	UJ	13	J	11	J
p,p'-DDE	ug/Kg	74	J	1.8	J	46	J	29	J
p,p'-DDT	ug/Kg	17	J	3.8	UJ	7	J	7.2	J
Dieldrin	ug/Kg	4.1	UJ	3.8	UJ	4.2	UJ	4.4	UJ
Alpha endosulfan	ug/Kg	2.1	UJ	1.9	UJ	2.1	UJ	2.3	UJ
Beta endosulfan	ug/Kg	4.1	UJ	3.8	UJ	4.2	UJ	4.4	UJ
Endosulfan sulfate	ug/Kg	4.1	UJ	3.8	UJ	4.2	UJ	4.4	UJ
Endrin	ug/Kg	4.1	UJ	3.8	UJ	4.2	UJ	4.4	UJ
Endrin aldehyde	ug/Kg	4.1	UJ	3.8	UJ	4.2	UJ	4.4	UJ
Endrin ketone	ug/Kg	4.1	UJ	3.8	UJ	4.2	UJ	4.4	UJ
Heptachlor epoxide	ug/Kg	2.1	UJ	1.9	UJ	2.1	UJ	2.3	UJ
Heptachlor	ug/Kg	2.1	UJ	1.9	UJ	2.1	UJ	2.3	UJ
Methoxychlor	ug/Kg	21	UJ	19	UJ	21	UJ	23	UJ
Toxaphene	ug/Kg	209	UJ	194	UJ	214	UJ	226	UJ

Analytical Data Summary

	StationID	W6-SB02		W6-SB02		W6-SB03		W6-SB04	
	SampleID	NDA103		NDA104FD1		NDA107		NDA109	
	Date Collected	04/24/00		04/24/00		04/24/00		04/24/00	
	SampleType	N		FD		N		N	
Parameter	Units								
Aldrin	ug/Kg	2.3	UJ	2.4	UJ	2.1	UJ	2.2	UJ
Alpha bhc (alpha hexachlorocyclohexane)	ug/Kg	2.3	UJ	2.4	UJ	2.1	UJ	2.2	UJ
Beta bhc (beta hexachlorocyclohexane)	ug/Kg	2.3	UJ	2.4	UJ	2.1	UJ	2.2	UJ
Delta bhc (delta hexachlorocyclohexane)	ug/Kg	2.3	UJ	2.4	UJ	2.1	UJ	2.2	UJ
Gamma bhc (lindane)	ug/Kg	2.3	UJ	2.4	UJ	2.1	UJ	2.2	UJ
Alpha-chlordane	ug/Kg	2.3	UJ	2.4	UJ	2.1	UJ	2.2	UJ
Gamma-chlordane	ug/Kg	2.3	UJ	2.4	UJ	2.1	UJ	2.2	UJ
p,p'-DDD	ug/Kg	4.5	UJ	4.7	UJ	4.2	UJ	0.62	J
p,p'-DDE	ug/Kg	3.8	J	3	J	6.7	J	1.2	J
p,p'-DDT	ug/Kg	4.5	UJ	4.7	UJ	3	J	4.3	UJ
Dieldrin	ug/Kg	4.5	UJ	4.7	UJ	4.2	UJ	4.3	UJ
Alpha endosulfan	ug/Kg	2.3	UJ	2.4	UJ	2.1	UJ	2.2	UJ
Beta endosulfan	ug/Kg	4.5	UJ	4.7	UJ	4.2	UJ	4.3	UJ
Endosulfan sulfate	ug/Kg	4.5	UJ	4.7	UJ	4.2	UJ	4.3	UJ
Endrin	ug/Kg	4.5	UJ	4.7	UJ	4.2	UJ	4.3	UJ
Endrin aldehyde	ug/Kg	4.5	UJ	4.7	UJ	4.2	UJ	4.3	UJ
Endrin ketone	ug/Kg	4.5	UJ	4.7	UJ	4.2	UJ	4.3	UJ
Heptachlor epoxide	ug/Kg	2.3	UJ	2.4	UJ	2.1	UJ	2.2	UJ
Heptachlor	ug/Kg	2.3	UJ	2.4	UJ	2.1	UJ	2.2	UJ
Methoxychlor	ug/Kg	23	UJ	24	UJ	21	UJ	22	UJ
Toxaphene	ug/Kg	232	UJ	239	UJ	212	UJ	221	UJ

Analytical Data Summary

	StationID	W6-SB05		NDW06SS09		NDW06SS09		NDW06SS10	
	SampleID	NDA111		NDW06FD04P-R01		NDW06SS09-R01		NDW06SS10-R01	
	Date Collected	04/24/00		08/28/03		08/28/03		08/28/03	
	SampleType	N		FD		N		N	
Parameter	Units								
Aldrin	ug/Kg	2.2	UJ	2.2	U	2.3	U	2.3	U
Alpha bhc (alpha hexachlorocyclohexane)	ug/Kg	2.2	UJ	2.2	UJ	2.3	UJ	2.3	UJ
Beta bhc (beta hexachlorocyclohexane)	ug/Kg	2.2	UJ	2.2	U	2.3	U	2.3	U
Delta bhc (delta hexachlorocyclohexane)	ug/Kg	2.2	UJ	2.2	U	2.3	UJ	2.3	UJ
Gamma bhc (lindane)	ug/Kg	2.2	UJ	2.2	U	2.3	U	2.3	U
Alpha-chlordane	ug/Kg	2.2	UJ	2.2	U	2.3	U	2.3	U
Gamma-chlordane	ug/Kg	2.2	UJ	2.2	U	2.3	U	2.3	U
p,p'-DDD	ug/Kg	2	J	4.3	U	4.4	U	4.4	U
p,p'-DDE	ug/Kg	7.5	J	0.16	J	4.4	U	4.4	U
p,p'-DDT	ug/Kg	4.4	UJ	4.3	U	4.4	U	4.4	U
Dieldrin	ug/Kg	4.4	UJ	4.3	U	4.4	U	4.4	U
Alpha endosulfan	ug/Kg	2.2	UJ	2.2	U	2.3	U	2.3	U
Beta endosulfan	ug/Kg	4.4	UJ	4.3	U	4.4	U	4.4	U
Endosulfan sulfate	ug/Kg	4.4	UJ	4.3	U	4.4	U	4.4	U
Endrin	ug/Kg	4.4	UJ	4.3	U	4.4	U	4.4	U
Endrin aldehyde	ug/Kg	4.4	UJ	4.3	U	4.4	U	4.4	U
Endrin ketone	ug/Kg	4.4	UJ	4.3	UJ	4.4	U	4.4	U
Heptachlor epoxide	ug/Kg	2.2	UJ	2.2	U	2.3	U	2.3	U
Heptachlor	ug/Kg	2.2	UJ	2.2	U	2.3	U	2.3	U
Methoxychlor	ug/Kg	22	UJ	22	U	23	U	23	U
Toxaphene	ug/Kg	224	UJ	220	UJ	230	UJ	230	UJ

Analytical Data Summary

	StationID	NDW06SS11		NDW06SS12		NDW06SS13		NDW06SS14	
	SampleID	NDW06SS11-R01		NDW06SS12-R01		NDW06SS13-R01		NDW06SS14-R01	
	Date Collected	08/28/03		08/28/03		08/28/03		08/28/03	
	SampleType	N		N		N		N	
Parameter	Units								
Aldrin	ug/Kg	2.2	UJ	2.4	U	2.2	U	3	U
Alpha bhc (alpha hexachlorocyclohexane)	ug/Kg	2.2	UJ	2.4	UJ	2.2	UJ	3	UJ
Beta bhc (beta hexachlorocyclohexane)	ug/Kg	2.2	UJ	2.4	U	2.2	U	3	U
Delta bhc (delta hexachlorocyclohexane)	ug/Kg	2.2	UJ	2.4	UJ	2.2	UJ	3	UJ
Gamma bhc (lindane)	ug/Kg	2.2	UJ	2.4	U	2.2	U	3	U
Alpha-chlordane	ug/Kg	2.2	UJ	2.4	U	2.2	U	3	U
Gamma-chlordane	ug/Kg	2.2	UJ	2.4	U	2.2	U	3	U
p,p'-DDD	ug/Kg	4.3	UJ	4.8	U	28	J	5.8	U
p,p'-DDE	ug/Kg	4.3	UJ	2.8	J	23	J	5.8	U
p,p'-DDT	ug/Kg	4.3	UJ	4.8	U	9.2	J	5.8	U
Dieldrin	ug/Kg	4.3	UJ	4.8	U	4.2	U	5.8	U
Alpha endosulfan	ug/Kg	2.2	UJ	2.4	U	2.2	U	3	U
Beta endosulfan	ug/Kg	4.3	UJ	4.8	U	4.2	U	5.8	U
Endosulfan sulfate	ug/Kg	4.3	UJ	4.8	U	4.2	U	5.8	U
Endrin	ug/Kg	4.3	UJ	4.8	U	4.2	U	5.8	U
Endrin aldehyde	ug/Kg	4.3	UJ	4.8	U	4.2	U	5.8	U
Endrin ketone	ug/Kg	4.3	UJ	4.8	U	4.2	U	5.8	U
Heptachlor epoxide	ug/Kg	2.2	UJ	2.4	U	2.2	U	3	U
Heptachlor	ug/Kg	2.2	UJ	2.4	U	2.2	U	3	U
Methoxychlor	ug/Kg	22	UJ	24	U	22	U	30	U
Toxaphene	ug/Kg	220	UJ	240	UJ	220	UJ	300	UJ

Analytical Data Summary

	StationID	NDW06SS15		NDW06SS16		NDW06SS17		NDW06SS18	
	SampleID	NDW06SS15-R01		NDW06SS16-R01		NDW06SS17-R01		NDW06SS18-R01	
	Date Collected	08/28/03		08/28/03		08/28/03		08/28/03	
	SampleType	N		N		N		N	
Parameter	Units								
Aldrin	ug/Kg	3.1	U	3	U	2.9	U	2.9	U
Alpha bhc (alpha hexachlorocyclohexane)	ug/Kg	3.1	UJ	3	U	2.9	U	2.9	UJ
Beta bhc (beta hexachlorocyclohexane)	ug/Kg	3.1	U	3	U	2.9	U	2.9	U
Delta bhc (delta hexachlorocyclohexane)	ug/Kg	3.1	UJ	3	UJ	2.9	UJ	2.9	UJ
Gamma bhc (lindane)	ug/Kg	3.1	U	3	U	2.9	U	2.9	U
Alpha-chlordane	ug/Kg	3.1	U	3	U	2.9	U	2.9	U
Gamma-chlordane	ug/Kg	3.1	U	3	U	2.9	U	2.9	U
p,p'-DDD	ug/Kg	2.5	J	5.8	U	5.6	U	5.7	U
p,p'-DDE	ug/Kg	6	U	5.8	U	5.6	U	5.7	U
p,p'-DDT	ug/Kg	6	U	5.8	U	5.6	U	5.7	U
Dieldrin	ug/Kg	6	U	5.8	U	5.6	U	5.7	U
Alpha endosulfan	ug/Kg	3.1	U	3	U	2.9	U	2.9	U
Beta endosulfan	ug/Kg	6	U	5.8	U	5.6	U	5.7	U
Endosulfan sulfate	ug/Kg	6	U	5.8	U	5.6	U	5.7	U
Endrin	ug/Kg	6	U	5.8	U	5.6	U	5.7	U
Endrin aldehyde	ug/Kg	6	U	5.8	U	5.6	U	5.7	U
Endrin ketone	ug/Kg	6	U	5.8	U	5.6	U	5.7	U
Heptachlor epoxide	ug/Kg	3.1	U	3	U	2.9	U	2.9	U
Heptachlor	ug/Kg	3.1	U	3	U	2.9	U	2.9	U
Methoxychlor	ug/Kg	31	U	30	U	29	U	29	U
Toxaphene	ug/Kg	310	UJ	300	U	290	U	290	UJ

Analytical Data Summary

	StationID	NDW06SS19		NDW06SS20		NDW06SS21		NDW06SS22	
	SampleID	NDW06SS19-R01		NDW06SS20-R01		NDW06SS21-R01		NDW06SS22-R01	
	Date Collected	08/28/03		08/28/03		08/28/03		08/28/03	
	SampleType	N		N		N		N	
Parameter	Units								
Aldrin	ug/Kg	29	U	25	U	22	U	2.2	U
Alpha bhc (alpha hexachlorocyclohexane)	ug/Kg	29	UJ	25	UJ	22	UJ	2.2	UJ
Beta bhc (beta hexachlorocyclohexane)	ug/Kg	29	U	25	U	22	U	2.2	U
Delta bhc (delta hexachlorocyclohexane)	ug/Kg	29	U	25	U	22	U	2.2	U
Gamma bhc (lindane)	ug/Kg	29	U	25	U	22	U	2.2	U
Alpha-chlordane	ug/Kg	29	U	25	U	22	U	2.2	U
Gamma-chlordane	ug/Kg	29	U	25	U	22	U	2.2	U
p,p'-DDD	ug/Kg	56	U	48	U	44	U	4.3	U
p,p'-DDE	ug/Kg	56	U	48	U	44	U	0.37	J
p,p'-DDT	ug/Kg	56	U	48	U	44	U	4.3	U
Dieldrin	ug/Kg	56	U	48	U	44	U	4.3	U
Alpha endosulfan	ug/Kg	29	U	25	U	22	U	2.2	U
Beta endosulfan	ug/Kg	56	U	48	U	44	U	4.3	U
Endosulfan sulfate	ug/Kg	56	U	48	U	44	U	4.3	U
Endrin	ug/Kg	56	U	48	U	44	U	4.3	U
Endrin aldehyde	ug/Kg	11	J	48	U	44	U	4.3	U
Endrin ketone	ug/Kg	56	UJ	48	UJ	44	UJ	4.3	UJ
Heptachlor epoxide	ug/Kg	29	U	25	U	22	U	2.2	U
Heptachlor	ug/Kg	29	U	25	U	22	U	2.2	U
Methoxychlor	ug/Kg	290	U	250	U	220	U	22	U
Toxaphene	ug/Kg	2900	UJ	2500	UJ	2200	UJ	220	UJ

Analytical Data Summary

	StationID	NDW06SS23	
	SampleID	NDW06SS23-R01	
	Date Collected	08/28/03	
	SampleType	N	
Parameter	Units		
Aldrin	ug/Kg	23	U
Alpha bhc (alpha hexachlorocyclohexane)	ug/Kg	23	UJ
Beta bhc (beta hexachlorocyclohexane)	ug/Kg	23	U
Delta bhc (delta hexachlorocyclohexane)	ug/Kg	23	U
Gamma bhc (lindane)	ug/Kg	23	U
Alpha-chlordane	ug/Kg	23	U
Gamma-chlordane	ug/Kg	23	U
p,p'-DDD	ug/Kg	4.2	J
p,p'-DDE	ug/Kg	18	J
p,p'-DDT	ug/Kg	44	U
Dieldrin	ug/Kg	44	U
Alpha endosulfan	ug/Kg	23	U
Beta endosulfan	ug/Kg	44	U
Endosulfan sulfate	ug/Kg	44	U
Endrin	ug/Kg	44	U
Endrin aldehyde	ug/Kg	44	U
Endrin ketone	ug/Kg	44	UJ
Heptachlor epoxide	ug/Kg	23	U
Heptachlor	ug/Kg	23	U
Methoxychlor	ug/Kg	230	U
Toxaphene	ug/Kg	2300	UJ

Analytical Data Summary

	StationID	W6-SB06		W6-SB07		W6-SB08		W6-SB01	
	SampleID	NDA113		NDA115		NDA117		NDA101	
	Date Collected	04/20/00		04/20/00		04/20/00		04/24/00	
	SampleType	N		N		N		N	
Parameter	Units								
1,2,4-TRICHLOROBENZENE	ug/Kg	551	U	558	U	760	U	549	U
1,2-DICHLOROBENZENE	ug/Kg	551	U	558	U	760	U	549	U
1,3-DICHLOROBENZENE	ug/Kg	551	U	558	U	760	U	549	U
1,4-DICHLOROBENZENE	ug/Kg	551	U	558	U	760	U	549	U
2,4,5-TRICHLOROPHENOL	ug/Kg	1650	U	1680	U	2280	U	1650	U
2,4,6-TRICHLOROPHENOL	ug/Kg	551	U	558	U	760	U	549	U
2,4-DICHLOROPHENOL	ug/Kg	551	U	558	U	760	U	549	U
2,4-DIMETHYLPHENOL	ug/Kg	551	U	558	U	760	U	549	U
2,4-DINITROPHENOL	ug/Kg	1650	U	1680	U	2280	U	1650	U
2,4-DINITROTOLUENE	ug/Kg	551	U	558	U	760	U	549	U
2,6-DINITROTOLUENE	ug/Kg	551	U	558	U	760	U	549	U
2-CHLORONAPHTHALENE	ug/Kg	551	U	558	U	760	U	549	U
2-CHLOROPHENOL	ug/Kg	551	U	558	U	760	U	549	U
2-METHYLNAPHTHALENE	ug/Kg	551	U	558	U	760	U	549	U
2-METHYLPHENOL (o-CRESOL)	ug/Kg	551	U	558	U	760	U	549	U
2-NITROANILINE	ug/Kg	1650	U	1680	U	2280	U	1650	U
2-NITROPHENOL	ug/Kg	551	U	558	U	760	U	549	U
3,3'-DICHLOROBENZIDINE	ug/Kg	1100	U	1120	U	1520	U	1100	U
3-NITROANILINE	ug/Kg	1650	U	1680	U	2280	U	1650	U
4,6-DINITRO-2-METHYLPHENOL	ug/Kg	1650	U	1680	U	2280	U	1650	U
4-BROMOPHENYL PHENYL ETHER	ug/Kg	551	U	558	U	760	U	549	U
4-CHLORO-3-METHYLPHENOL	ug/Kg	551	U	558	U	760	U	549	U
4-CHLOROANILINE	ug/Kg	551	U	558	U	760	U	549	U
4-CHLOROPHENYL PHENYL ETHER	ug/Kg	551	U	558	U	760	U	549	U
4-METHYLPHENOL (p-CRESOL)	ug/Kg								
4-NITROANILINE	ug/Kg	1650	U	1680	U	2280	U	1650	U
4-NITROPHENOL	ug/Kg	1650	U	1680	U	2280	U	1650	U
ACENAPHTHENE	ug/Kg	551	U	558	U	760	U	549	U
ACENAPHTHYLENE	ug/Kg	551	U	558	U	760	U	549	U
ACETOPHENONE	ug/Kg								
ANTHRACENE	ug/Kg	551	U	558	U	760	U	549	U
ATRAZINE	ug/Kg								
BENZALDEHYDE	ug/Kg								
BENZO(a)ANTHRACENE	ug/Kg	551	U	558	U	41	J	549	U
BENZO(a)PYRENE	ug/Kg	52	J	558	U	81	J	549	U
BENZO(b)FLUORANTHENE	ug/Kg	68	J	558	U	121	J	549	U
BENZO(g,h,i)PERYLENE	ug/Kg	40	J	558	U	56	J	549	U

Analytical Data Summary

	StationID	W6-SB02		W6-SB02		W6-SB03		W6-SB04	
	SampleID	NDA103		NDA104FD1		NDA107		NDA109	
	Date Collected	04/24/00		04/24/00		04/24/00		04/24/00	
	SampleType	N		FD		N		N	
Parameter	Units								
1,2,4-TRICHLOROBENZENE	ug/Kg	627	U	639	U	506	U	503	U
1,2-DICHLOROBENZENE	ug/Kg	627	U	639	U	506	U	503	U
1,3-DICHLOROBENZENE	ug/Kg	627	U	639	U	506	U	503	U
1,4-DICHLOROBENZENE	ug/Kg	627	U	639	U	506	U	503	U
2,4,5-TRICHLOROPHENOL	ug/Kg	1880	U	1920	U	1520	U	1510	U
2,4,6-TRICHLOROPHENOL	ug/Kg	627	U	639	U	506	U	503	U
2,4-DICHLOROPHENOL	ug/Kg	627	U	639	U	506	U	503	U
2,4-DIMETHYLPHENOL	ug/Kg	627	U	639	U	506	U	503	U
2,4-DINITROPHENOL	ug/Kg	1880	U	1920	U	1520	U	1510	U
2,4-DINITROTOLUENE	ug/Kg	627	U	639	U	506	U	503	U
2,6-DINITROTOLUENE	ug/Kg	627	U	639	U	506	U	503	U
2-CHLORONAPHTHALENE	ug/Kg	627	U	639	U	506	U	503	U
2-CHLOROPHENOL	ug/Kg	627	U	639	U	506	U	503	U
2-METHYLNAPHTHALENE	ug/Kg	627	U	639	U	506	U	503	U
2-METHYLPHENOL (o-CRESOL)	ug/Kg	627	U	639	U	506	U	503	U
2-NITROANILINE	ug/Kg	1880	U	1920	U	1520	U	1510	U
2-NITROPHENOL	ug/Kg	627	U	639	U	506	U	503	U
3,3'-DICHLOROBENZIDINE	ug/Kg	1250	U	1280	U	1010	U	1010	U
3-NITROANILINE	ug/Kg	1880	U	1920	U	1520	U	1510	U
4,6-DINITRO-2-METHYLPHENOL	ug/Kg	1880	U	1920	U	1520	U	1510	U
4-BROMOPHENYL PHENYL ETHER	ug/Kg	627	U	639	U	506	U	503	U
4-CHLORO-3-METHYLPHENOL	ug/Kg	627	U	639	U	506	U	503	U
4-CHLOROANILINE	ug/Kg	627	U	639	U	506	U	503	U
4-CHLOROPHENYL PHENYL ETHER	ug/Kg	627	U	639	U	506	U	503	U
4-METHYLPHENOL (p-CRESOL)	ug/Kg								
4-NITROANILINE	ug/Kg	1880	U	1920	U	1520	U	1510	U
4-NITROPHENOL	ug/Kg	1880	U	1920	U	1520	U	1510	U
ACENAPHTHENE	ug/Kg	627	U	639	U	506	U	503	U
ACENAPHTHYLENE	ug/Kg	627	U	639	U	506	U	503	U
ACETOPHENONE	ug/Kg								
ANTHRACENE	ug/Kg	627	U	639	U	506	U	503	U
ATRAZINE	ug/Kg								
BENZALDEHYDE	ug/Kg								
BENZO(a)ANTHRACENE	ug/Kg	627	U	639	U	506	U	503	U
BENZO(a)PYRENE	ug/Kg	627	U	639	U	506	U	503	U
BENZO(b)FLUORANTHENE	ug/Kg	627	U	639	U	506	U	503	U
BENZO(g,h,i)PERYLENE	ug/Kg	627	U	639	U	506	U	503	U

Analytical Data Summary

	StationID	W6-SB05		NDW06SS09		NDW06SS09		NDW06SS10	
	SampleID	NDA111		NDW06FD04P-R01		NDW06SS09-R01		NDW06SS10-R01	
	Date Collected	04/24/00		08/28/03		08/28/03		08/28/03	
	SampleType	N		FD		N		N	
Parameter	Units								
1,2,4-TRICHLOROBENZENE	ug/Kg	607	U						
1,2-DICHLOROBENZENE	ug/Kg	607	U						
1,3-DICHLOROBENZENE	ug/Kg	607	U						
1,4-DICHLOROBENZENE	ug/Kg	607	U						
2,4,5-TRICHLOROPHENOL	ug/Kg	1820	U	1270	U	1320	U	1300	U
2,4,6-TRICHLOROPHENOL	ug/Kg	607	U	424	U	441	U	435	U
2,4-DICHLOROPHENOL	ug/Kg	607	U	424	U	441	U	435	U
2,4-DIMETHYLPHENOL	ug/Kg	607	U	424	U	441	U	435	U
2,4-DINITROPHENOL	ug/Kg	1820	U	1270	U	1320	U	1300	U
2,4-DINITROTOLUENE	ug/Kg	607	U	424	U	441	U	435	U
2,6-DINITROTOLUENE	ug/Kg	607	U	424	U	441	U	435	U
2-CHLORONAPHTHALENE	ug/Kg	607	U	424	U	441	U	435	U
2-CHLOROPHENOL	ug/Kg	607	U	424	U	441	U	435	U
2-METHYLNAPHTHALENE	ug/Kg	311	J	424	U	441	U	435	U
2-METHYLPHENOL (o-CRESOL)	ug/Kg	607	U	424	U	441	U	435	U
2-NITROANILINE	ug/Kg	1820	U	1270	U	1320	U	1300	U
2-NITROPHENOL	ug/Kg	607	U	424	U	441	U	435	U
3,3'-DICHLOROBENZIDINE	ug/Kg	1210	U	861	U	895	U	883	U
3-NITROANILINE	ug/Kg	1820	U	1270	U	1320	U	1300	U
4,6-DINITRO-2-METHYLPHENOL	ug/Kg	1820	U	1270	U	1320	U	1300	U
4-BROMOPHENYL PHENYL ETHER	ug/Kg	607	U	424	U	441	U	435	U
4-CHLORO-3-METHYLPHENOL	ug/Kg	607	U	424	U	441	U	435	U
4-CHLOROANILINE	ug/Kg	607	U	424	U	441	U	435	U
4-CHLOROPHENYL PHENYL ETHER	ug/Kg	607	U	424	U	441	U	435	U
4-METHYLPHENOL (p-CRESOL)	ug/Kg			424	U	441	U	435	U
4-NITROANILINE	ug/Kg	1820	U	1270	U	1320	U	1300	U
4-NITROPHENOL	ug/Kg	1820	U	1270	U	1320	U	1300	U
ACENAPHTHENE	ug/Kg	684	=	424	U	441	U	435	U
ACENAPHTHYLENE	ug/Kg	607	U	424	U	441	U	435	U
ACETOPHENONE	ug/Kg			424	U	441	U	435	U
ANTHRACENE	ug/Kg	902	=	424	U	441	U	435	U
ATRAZINE	ug/Kg			424	U	441	U	435	U
BENZALDEHYDE	ug/Kg			424	U	441	U	435	U
BENZO(a)ANTHRACENE	ug/Kg	1870	=	424	U	441	U	435	U
BENZO(a)PYRENE	ug/Kg	1510	=	424	U	441	U	435	U
BENZO(b)FLUORANTHENE	ug/Kg	1800	=	424	U	441	U	435	U
BENZO(g,h,i)PERYLENE	ug/Kg	432	J	424	U	441	U	435	U

Analytical Data Summary

	StationID	NDW06SS11		NDW06SS12		NDW06SS13		NDW06SS14	
	SampleID	NDW06SS11-R01		NDW06SS12-R01		NDW06SS13-R01		NDW06SS14-R01	
	Date Collected	08/28/03		08/28/03		08/28/03		08/28/03	
	SampleType	N		N		N		N	
Parameter	Units								
1,2,4-TRICHLOROBENZENE	ug/Kg								
1,2-DICHLOROBENZENE	ug/Kg								
1,3-DICHLOROBENZENE	ug/Kg								
1,4-DICHLOROBENZENE	ug/Kg								
2,4,5-TRICHLOROPHENOL	ug/Kg	1290	U	1440	U	1250	U	1720	U
2,4,6-TRICHLOROPHENOL	ug/Kg	430	U	479	U	416	U	574	U
2,4-DICHLOROPHENOL	ug/Kg	430	U	479	U	416	U	574	U
2,4-DIMETHYLPHENOL	ug/Kg	430	U	479	U	416	U	574	U
2,4-DINITROPHENOL	ug/Kg	1290	U	1440	U	1250	U	1720	U
2,4-DINITROTOLUENE	ug/Kg	430	U	479	U	416	U	574	U
2,6-DINITROTOLUENE	ug/Kg	430	U	479	U	416	U	574	U
2-CHLORONAPHTHALENE	ug/Kg	430	U	479	U	416	U	574	U
2-CHLOROPHENOL	ug/Kg	430	U	479	U	416	U	574	U
2-METHYLNAPHTHALENE	ug/Kg	430	U	479	U	416	U	574	U
2-METHYLPHENOL (o-CRESOL)	ug/Kg	430	U	479	U	416	U	574	U
2-NITROANILINE	ug/Kg	1290	U	1440	U	1250	U	1720	U
2-NITROPHENOL	ug/Kg	430	U	479	U	416	U	574	U
3,3'-DICHLOROBENZIDINE	ug/Kg	874	U	972	U	845	U	1160	U
3-NITROANILINE	ug/Kg	1290	U	1440	U	1250	U	1720	U
4,6-DINITRO-2-METHYLPHENOL	ug/Kg	1290	U	1440	U	1250	U	1720	U
4-BROMOPHENYL PHENYL ETHER	ug/Kg	430	U	479	U	416	U	574	U
4-CHLORO-3-METHYLPHENOL	ug/Kg	430	U	479	U	416	U	574	U
4-CHLOROANILINE	ug/Kg	430	U	479	U	416	U	574	U
4-CHLOROPHENYL PHENYL ETHER	ug/Kg	430	U	479	U	416	U	574	U
4-METHYLPHENOL (p-CRESOL)	ug/Kg	430	U	479	U	416	U	574	U
4-NITROANILINE	ug/Kg	1290	U	1440	U	1250	U	1720	U
4-NITROPHENOL	ug/Kg	1290	U	1440	U	1250	U	1720	U
ACENAPHTHENE	ug/Kg	430	U	479	U	416	U	574	U
ACENAPHTHYLENE	ug/Kg	430	U	479	U	28.2	J	574	U
ACETOPHENONE	ug/Kg	430	U	479	U	416	U	574	U
ANTHRACENE	ug/Kg	430	U	479	U	84.5	J	574	U
ATRAZINE	ug/Kg	430	U	479	U	416	U	574	U
BENZALDEHYDE	ug/Kg	430	U	479	U	416	U	574	U
BENZO(a)ANTHRACENE	ug/Kg	430	U	184	J	348	J	574	U
BENZO(a)PYRENE	ug/Kg	430	U	220	J	925	=	574	U
BENZO(b)FLUORANTHENE	ug/Kg	430	U	268	J	595	=	574	U
BENZO(g,h,i)PERYLENE	ug/Kg	430	U	153	J	1160	=	574	U

Analytical Data Summary

	StationID	NDW06SS15		NDW06SS16		NDW06SS17		NDW06SS18	
	SampleID	NDW06SS15-R01		NDW06SS16-R01		NDW06SS17-R01		NDW06SS18-R01	
	Date Collected	08/28/03		08/28/03		08/28/03		08/28/03	
	SampleType	N		N		N		N	
Parameter	Units								
1,2,4-TRICHLOROBENZENE	ug/Kg								
1,2-DICHLOROBENZENE	ug/Kg								
1,3-DICHLOROBENZENE	ug/Kg								
1,4-DICHLOROBENZENE	ug/Kg								
2,4,5-TRICHLOROPHENOL	ug/Kg	1790	U	1720	U	1660	U	1710	U
2,4,6-TRICHLOROPHENOL	ug/Kg	597	U	575	U	552	U	569	U
2,4-DICHLOROPHENOL	ug/Kg	597	U	575	U	552	U	569	U
2,4-DIMETHYLPHENOL	ug/Kg	597	U	575	U	552	U	569	U
2,4-DINITROPHENOL	ug/Kg	1790	U	1720	U	1660	U	1710	U
2,4-DINITROTOLUENE	ug/Kg	597	U	575	U	552	U	569	U
2,6-DINITROTOLUENE	ug/Kg	597	U	575	U	552	U	569	U
2-CHLORONAPHTHALENE	ug/Kg	597	U	575	U	552	U	569	U
2-CHLOROPHENOL	ug/Kg	597	U	575	U	552	U	569	U
2-METHYLNAPHTHALENE	ug/Kg	597	U	575	U	552	U	569	U
2-METHYLPHENOL (o-CRESOL)	ug/Kg	597	U	575	U	552	U	569	U
2-NITROANILINE	ug/Kg	1790	U	1720	U	1660	U	1710	U
2-NITROPHENOL	ug/Kg	597	U	575	U	552	U	569	U
3,3'-DICHLOROBENZIDINE	ug/Kg	1210	U	1170	U	1120	U	1160	U
3-NITROANILINE	ug/Kg	1790	U	1720	U	1660	U	1710	U
4,6-DINITRO-2-METHYLPHENOL	ug/Kg	1790	U	1720	U	1660	U	1710	U
4-BROMOPHENYL PHENYL ETHER	ug/Kg	597	U	575	U	552	U	569	U
4-CHLORO-3-METHYLPHENOL	ug/Kg	597	U	575	U	552	U	569	U
4-CHLOROANILINE	ug/Kg	597	U	575	U	552	U	569	U
4-CHLOROPHENYL PHENYL ETHER	ug/Kg	597	U	575	U	552	U	569	U
4-METHYLPHENOL (p-CRESOL)	ug/Kg	597	U	575	U	552	U	569	U
4-NITROANILINE	ug/Kg	1790	U	1720	U	1660	U	1710	U
4-NITROPHENOL	ug/Kg	1790	U	1720	U	1660	U	1710	U
ACENAPHTHENE	ug/Kg	597	U	575	U	552	U	569	U
ACENAPHTHYLENE	ug/Kg	597	U	575	U	552	U	569	U
ACETOPHENONE	ug/Kg	597	U	575	U	552	U	569	U
ANTHRACENE	ug/Kg	597	U	575	U	552	U	569	U
ATRAZINE	ug/Kg	597	U	575	U	552	U	569	U
BENZALDEHYDE	ug/Kg	597	U	575	U	552	U	569	U
BENZO(a)ANTHRACENE	ug/Kg	597	U	575	U	552	U	92.2	J
BENZO(a)PYRENE	ug/Kg	597	U	575	U	552	U	136	J
BENZO(b)FLUORANTHENE	ug/Kg	597	U	575	U	552	U	172	J
BENZO(g,h,i)PERYLENE	ug/Kg	597	U	575	U	552	U	76	J

Analytical Data Summary

Parameter	StationID	NDW06SS19		NDW06SS20		NDW06SS21		NDW06SS22	
	SampleID	NDW06SS19-R01		NDW06SS20-R01		NDW06SS21-R01		NDW06SS22-R01	
	Date Collected	08/28/03		08/28/03		08/28/03		08/28/03	
	SampleType	N		N		N		N	
	Units								
1,2,4-TRICHLOROBENZENE	ug/Kg								
1,2-DICHLOROBENZENE	ug/Kg								
1,3-DICHLOROBENZENE	ug/Kg								
1,4-DICHLOROBENZENE	ug/Kg								
2,4,5-TRICHLOROPHENOL	ug/Kg	1660	U	1420	U	1290	U	1290	U
2,4,6-TRICHLOROPHENOL	ug/Kg	555	U	473	U	431	U	430	U
2,4-DICHLOROPHENOL	ug/Kg	555	U	473	U	431	U	430	U
2,4-DIMETHYLPHENOL	ug/Kg	555	U	473	U	431	U	430	U
2,4-DINITROPHENOL	ug/Kg	1660	U	1420	U	1290	U	1290	U
2,4-DINITROTOLUENE	ug/Kg	555	U	473	U	431	U	430	U
2,6-DINITROTOLUENE	ug/Kg	555	U	473	U	431	U	430	U
2-CHLORONAPHTHALENE	ug/Kg	555	U	473	U	431	U	430	U
2-CHLOROPHENOL	ug/Kg	555	U	473	U	431	U	430	U
2-METHYLNAPHTHALENE	ug/Kg	555	U	473	U	431	U	430	U
2-METHYLPHENOL (o-CRESOL)	ug/Kg	555	U	473	U	431	U	430	U
2-NITROANILINE	ug/Kg	1660	U	1420	U	1290	U	1290	U
2-NITROPHENOL	ug/Kg	555	U	473	U	431	U	430	U
3,3'-DICHLOROBENZIDINE	ug/Kg	1130	U	960	U	875	U	874	U
3-NITROANILINE	ug/Kg	1660	U	1420	U	1290	U	1290	U
4,6-DINITRO-2-METHYLPHENOL	ug/Kg	1660	U	1420	U	1290	U	1290	U
4-BROMOPHENYL PHENYL ETHER	ug/Kg	555	U	473	U	431	U	430	U
4-CHLORO-3-METHYLPHENOL	ug/Kg	555	U	473	U	431	U	430	U
4-CHLOROANILINE	ug/Kg	555	U	473	U	431	U	430	U
4-CHLOROPHENYL PHENYL ETHER	ug/Kg	555	U	473	U	431	U	430	U
4-METHYLPHENOL (p-CRESOL)	ug/Kg	555	U	473	U	431	U	430	U
4-NITROANILINE	ug/Kg	1660	U	1420	U	1290	U	1290	U
4-NITROPHENOL	ug/Kg	1660	U	1420	U	1290	U	1290	U
ACENAPHTHENE	ug/Kg	555	U	473	U	431	U	430	U
ACENAPHTHYLENE	ug/Kg	555	U	473	U	431	U	430	U
ACETOPHENONE	ug/Kg	555	U	473	U	431	U	430	U
ANTHRACENE	ug/Kg	555	U	473	U	431	U	430	U
ATRAZINE	ug/Kg	555	U	473	U	431	U	430	U
BENZALDEHYDE	ug/Kg	555	U	473	U	431	U	430	U
BENZO(a)ANTHRACENE	ug/Kg	555	U	473	U	431	U	430	U
BENZO(a)PYRENE	ug/Kg	555	U	473	U	431	U	430	U
BENZO(b)FLUORANTHENE	ug/Kg	28.7	J	473	U	431	U	430	U
BENZO(g,h,i)PERYLENE	ug/Kg	555	U	473	U	431	U	430	U

Analytical Data Summary

	StationID	NDW06SS23	
	SampleID	NDW06SS23-R01	
	Date Collected	08/28/03	
	SampleType	N	
Parameter	Units		
1,2,4-TRICHLOROBENZENE	ug/Kg		
1,2-DICHLOROBENZENE	ug/Kg		
1,3-DICHLOROBENZENE	ug/Kg		
1,4-DICHLOROBENZENE	ug/Kg		
2,4,5-TRICHLOROPHENOL	ug/Kg	1300	U
2,4,6-TRICHLOROPHENOL	ug/Kg	434	U
2,4-DICHLOROPHENOL	ug/Kg	434	U
2,4-DIMETHYLPHENOL	ug/Kg	434	U
2,4-DINITROPHENOL	ug/Kg	1300	U
2,4-DINITROTOLUENE	ug/Kg	434	U
2,6-DINITROTOLUENE	ug/Kg	434	U
2-CHLORONAPHTHALENE	ug/Kg	434	U
2-CHLOROPHENOL	ug/Kg	434	U
2-METHYLNAPHTHALENE	ug/Kg	434	U
2-METHYLPHENOL (o-CRESOL)	ug/Kg	434	U
2-NITROANILINE	ug/Kg	1300	U
2-NITROPHENOL	ug/Kg	434	U
3,3'-DICHLOROBENZIDINE	ug/Kg	880	U
3-NITROANILINE	ug/Kg	1300	U
4,6-DINITRO-2-METHYLPHENOL	ug/Kg	1300	U
4-BROMOPHENYL PHENYL ETHER	ug/Kg	434	U
4-CHLORO-3-METHYLPHENOL	ug/Kg	434	U
4-CHLOROANILINE	ug/Kg	434	U
4-CHLOROPHENYL PHENYL ETHER	ug/Kg	434	U
4-METHYLPHENOL (p-CRESOL)	ug/Kg	434	U
4-NITROANILINE	ug/Kg	1300	U
4-NITROPHENOL	ug/Kg	1300	U
ACENAPHTHENE	ug/Kg	434	U
ACENAPHTHYLENE	ug/Kg	434	U
ACETOPHENONE	ug/Kg	434	U
ANTHRACENE	ug/Kg	434	U
ATRAZINE	ug/Kg	434	U
BENZALDEHYDE	ug/Kg	434	U
BENZO(a)ANTHRACENE	ug/Kg	434	U
BENZO(a)PYRENE	ug/Kg	41.7	J
BENZO(b)FLUORANTHENE	ug/Kg	55.1	J
BENZO(g,h,i)PERYLENE	ug/Kg	54.2	J

Analytical Data Summary

Parameter	Units	StationID		W6-SB06		W6-SB07		W6-SB08		W6-SB01	
		SampleID		NDA113		NDA115		NDA117		NDA101	
		Date Collected		04/20/00		04/20/00		04/20/00		04/24/00	
		SampleType		N		N		N		N	
BENZO(k)FLUORANTHENE	ug/Kg			59	J	558	U	88	J	549	U
BENZYL BUTYL PHTHALATE	ug/Kg			551	U	558	U	760	U	549	U
BIPHENYL (DIPHENYL)	ug/Kg										
bis(2-CHLOROETHOXY) METHANE	ug/Kg			551	U	558	U	760	U	549	U
bis(2-CHLOROETHYL) ETHER (2-CHLOROETHYL ETHER)	ug/Kg			551	U	558	U	760	U	549	U
bis(2-CHLOROISOPROPYL) ETHER	ug/Kg			551	U	558	U	760	U	549	U
bis(2-ETHYLHEXYL) PHTHALATE	ug/Kg			135	J	558	U	760	U	1400	=
CAPROLACTAM	ug/Kg										
CARBAZOLE	ug/Kg			551	U	558	U	760	U	549	U
CHRYSENE	ug/Kg			52	J	558	U	118	J	549	U
CRESOLS, m & p	ug/Kg			551	U	558	U	760	U	549	U
DI-n-BUTYL PHTHALATE	ug/Kg			551	U	558	U	760	U	549	U
DI-n-OCTYLPHTHALATE	ug/Kg			551	U	558	U	760	U	549	U
DIBENZ(a,h)ANTHRACENE	ug/Kg			551	U	558	U	760	U	549	U
DIBENZOFURAN	ug/Kg			551	U	558	U	760	U	549	U
DIETHYL PHTHALATE	ug/Kg			551	U	558	U	760	U	549	U
DIMETHYL PHTHALATE	ug/Kg			551	U	558	U	760	U	549	U
FLUORANTHENE	ug/Kg			551	U	558	U	50	J	34	U
FLUORENE	ug/Kg			551	U	558	U	760	U	549	U
HEXACHLOROBENZENE	ug/Kg			551	U	558	U	760	U	549	U
HEXACHLOROBUTADIENE	ug/Kg			551	U	558	U	760	U	549	U
HEXACHLOROCYCLOPENTADIENE	ug/Kg			551	U	558	U	760	U	549	U
HEXACHLOROETHANE	ug/Kg			551	U	558	U	760	U	549	U
INDENO(1,2,3-c,d)PYRENE	ug/Kg			50	J	558	U	74	J	549	U
ISOPHORONE	ug/Kg			551	U	558	U	760	U	549	U
N-NITROSODI-n-PROPYLAMINE	ug/Kg			551	U	558	U	760	U	549	U
N-NITROSODIPHENYLAMINE	ug/Kg			551	U	558	U	760	U	549	U
NAPHTHALENE	ug/Kg			551	U	558	U	760	U	549	U
NITROBENZENE	ug/Kg			551	U	558	U	760	U	549	U
PENTACHLOROPHENOL	ug/Kg			1650	U	1680	U	2280	U	1650	U
PHENANTHRENE	ug/Kg			551	U	558	U	760	U	549	U
PHENOL	ug/Kg			551	U	558	U	760	U	549	U
PYRENE	ug/Kg			33	J	558	U	51	J	37	J

Analytical Data Summary

	StationID	W6-SB02		W6-SB02		W6-SB03		W6-SB04	
	SampleID	NDA103		NDA104FD1		NDA107		NDA109	
	Date Collected	04/24/00		04/24/00		04/24/00		04/24/00	
	SampleType	N		FD		N		N	
Parameter	Units								
BENZO(k)FLUORANTHENE	ug/Kg	627	U	639	U	506	U	503	U
BENZYL BUTYL PHTHALATE	ug/Kg	627	U	639	U	506	U	503	U
BIPHENYL (DIPHENYL)	ug/Kg								
bis(2-CHLOROETHOXY) METHANE	ug/Kg	627	U	639	U	506	U	503	U
bis(2-CHLOROETHYL) ETHER (2-CHLOROETHYL ETHER)	ug/Kg	627	U	639	U	506	U	503	U
bis(2-CHLOROISOPROPYL) ETHER	ug/Kg	627	U	639	U	506	U	503	U
bis(2-ETHYLHEXYL) PHTHALATE	ug/Kg	627	U	639	U	506	U	503	U
CAPROLACTAM	ug/Kg								
CARBAZOLE	ug/Kg	627	U	639	U	506	U	503	U
CHRYSENE	ug/Kg	627	U	639	U	506	U	503	U
CRESOLS, m & p	ug/Kg	627	U	639	U	506	U	503	U
DI-n-BUTYL PHTHALATE	ug/Kg	627	U	639	U	506	U	503	U
DI-n-OCTYLPHTHALATE	ug/Kg	627	U	639	U	506	U	503	U
DIBENZ(a,h)ANTHRACENE	ug/Kg	627	U	639	U	506	U	503	U
DIBENZOFURAN	ug/Kg	627	U	639	U	506	U	503	U
DIETHYL PHTHALATE	ug/Kg	627	U	639	U	506	U	503	U
DIMETHYL PHTHALATE	ug/Kg	627	U	639	U	506	U	503	U
FLUORANTHENE	ug/Kg	627	U	639	U	506	U	503	U
FLUORENE	ug/Kg	627	U	639	U	506	U	503	U
HEXACHLOROBENZENE	ug/Kg	627	U	639	U	506	U	503	U
HEXACHLOROBUTADIENE	ug/Kg	627	U	639	U	506	U	503	U
HEXACHLOROCYCLOPENTADIENE	ug/Kg	627	U	639	U	506	U	503	U
HEXACHLOROETHANE	ug/Kg	627	U	639	U	506	U	503	U
INDENO(1,2,3-c,d)PYRENE	ug/Kg	627	U	639	U	506	U	503	U
ISOPHORONE	ug/Kg	627	U	639	U	506	U	503	U
N-NITROSODI-n-PROPYLAMINE	ug/Kg	627	U	639	U	506	U	503	U
N-NITROSODIPHENYLAMINE	ug/Kg	627	U	639	U	506	U	503	U
NAPHTHALENE	ug/Kg	627	U	639	U	506	U	503	U
NITROBENZENE	ug/Kg	627	U	639	U	506	U	503	U
PENTACHLOROPHENOL	ug/Kg	1880	U	1920	U	1520	U	1510	U
PHENANTHRENE	ug/Kg	627	U	639	U	506	U	503	U
PHENOL	ug/Kg	627	U	639	U	506	U	503	U
PYRENE	ug/Kg	627	U	639	U	506	U	503	U

Analytical Data Summary

Parameter	Units	StationID		NDW06SS09		NDW06SS09		NDW06SS10	
		SampleID		NDW06FD04P-R01		NDW06SS09-R01		NDW06SS10-R01	
		Date Collected		08/28/03		08/28/03		08/28/03	
		SampleType		FD		N		N	
BENZO(k)FLUORANTHENE	ug/Kg	1230	=	424	U	441	U	435	U
BENZYL BUTYL PHTHALATE	ug/Kg	607	U	424	U	441	U	435	U
BIPHENYL (DIPHENYL)	ug/Kg			424	U	441	U	435	U
bis(2-CHLOROETHOXY) METHANE	ug/Kg	607	U	424	U	441	U	435	U
bis(2-CHLOROETHYL) ETHER (2-CHLOROETHYL ETHER)	ug/Kg	607	U	424	U	441	U	435	U
bis(2-CHLOROISOPROPYL) ETHER	ug/Kg	607	U	424	U	441	U	435	U
bis(2-ETHYLHEXYL) PHTHALATE	ug/Kg	607	U	424	U	441	U	435	U
CAPROLACTAM	ug/Kg			424	U	441	U	435	U
CARBAZOLE	ug/Kg	431	J	424	U	441	U	435	U
CHRYSENE	ug/Kg	2000	=	424	U	441	U	435	U
CRESOLS, m & p	ug/Kg	607	U						
DI-n-BUTYL PHTHALATE	ug/Kg	607	U	424	U	441	U	435	U
DI-n-OCTYLPHTHALATE	ug/Kg	607	U	424	U	441	U	435	U
DIBENZ(a,h)ANTHRACENE	ug/Kg	254	J	424	U	441	U	435	U
DIBENZOFURAN	ug/Kg	784	=	424	U	441	U	435	U
DIETHYL PHTHALATE	ug/Kg	607	U	424	U	441	U	435	U
DIMETHYL PHTHALATE	ug/Kg	607	U	424	U	441	U	435	U
FLUORANTHENE	ug/Kg	4060	=	424	U	441	U	435	U
FLUORENE	ug/Kg	440	J	424	U	441	U	435	U
HEXACHLOROBENZENE	ug/Kg	607	U	424	U	441	U	435	U
HEXACHLOROBUTADIENE	ug/Kg	607	U	424	U	441	U	435	U
HEXACHLOROCYCLOPENTADIENE	ug/Kg	607	U	424	U	441	U	435	U
HEXACHLOROETHANE	ug/Kg	607	U	424	U	441	U	435	U
INDENO(1,2,3-c,d)PYRENE	ug/Kg	653	=	424	U	441	U	435	U
ISOPHORONE	ug/Kg	607	U	424	U	441	U	435	U
N-NITROSODI-n-PROPYLAMINE	ug/Kg	607	U	424	U	441	U	435	U
N-NITROSODIPHENYLAMINE	ug/Kg	607	U	424	U	441	U	435	U
NAPHTHALENE	ug/Kg	621	=	424	U	441	U	435	U
NITROBENZENE	ug/Kg	607	U	424	U	441	U	435	U
PENTACHLOROPHENOL	ug/Kg	1820	U	1270	U	1320	U	1300	U
PHENANTHRENE	ug/Kg	4860	=	424	U	441	U	435	U
PHENOL	ug/Kg	607	U	424	U	441	U	435	U
PYRENE	ug/Kg	2900	=	424	U	441	U	435	U

Analytical Data Summary

Parameter	Units	StationID		NDW06SS12		NDW06SS13		NDW06SS14	
		SampleID		NDW06SS12-R01		NDW06SS13-R01		NDW06SS14-R01	
		Date Collected		08/28/03		08/28/03		08/28/03	
		SampleType		N		N		N	
BENZO(k)FLUORANTHENE	ug/Kg	430	U	205	J	509	=	574	U
BENZYL BUTYL PHTHALATE	ug/Kg	430	U	479	U	416	U	574	U
BIPHENYL (DIPHENYL)	ug/Kg	430	U	479	U	416	U	574	U
bis(2-CHLOROETHOXY) METHANE	ug/Kg	430	U	479	U	416	U	574	U
bis(2-CHLOROETHYL) ETHER (2-CHLOROETHYL ETHER)	ug/Kg	430	U	479	U	416	U	574	U
bis(2-CHLOROISOPROPYL) ETHER	ug/Kg	430	U	479	U	416	U	574	U
bis(2-ETHYLHEXYL) PHTHALATE	ug/Kg	430	U	479	U	416	U	574	U
CAPROLACTAM	ug/Kg	430	U	479	U	416	U	574	U
CARBAZOLE	ug/Kg	430	U	479	U	416	U	574	U
CHRYSENE	ug/Kg	430	U	254	J	442	=	574	U
CRESOLS, m & p	ug/Kg								
DI-n-BUTYL PHTHALATE	ug/Kg	430	U	479	U	416	U	574	U
DI-n-OCTYLPHTHALATE	ug/Kg	430	U	479	U	416	U	574	U
DIBENZ(a,h)ANTHRACENE	ug/Kg	430	U	51.7	J	345	J	574	U
DIBENZOFURAN	ug/Kg	430	U	479	U	416	U	574	U
DIETHYL PHTHALATE	ug/Kg	430	U	479	U	416	U	574	U
DIMETHYL PHTHALATE	ug/Kg	430	U	479	U	416	U	574	U
FLUORANTHENE	ug/Kg	430	U	268	J	300	J	574	U
FLUORENE	ug/Kg	430	U	479	U	416	U	574	U
HEXACHLOROBENZENE	ug/Kg	430	U	479	U	416	U	574	U
HEXACHLOROBUTADIENE	ug/Kg	430	U	479	U	416	U	574	U
HEXACHLOROCYCLOPENTADIENE	ug/Kg	430	U	479	U	416	U	574	U
HEXACHLOROETHANE	ug/Kg	430	U	479	U	416	U	574	U
INDENO(1,2,3-c,d)PYRENE	ug/Kg	430	U	204	J	1130	=	574	U
ISOPHORONE	ug/Kg	430	U	479	U	416	U	574	U
N-NITROSODI-n-PROPYLAMINE	ug/Kg	430	U	479	U	416	U	574	U
N-NITROSODIPHENYLAMINE	ug/Kg	430	U	479	U	416	U	574	U
NAPHTHALENE	ug/Kg	430	U	479	U	416	U	574	U
NITROBENZENE	ug/Kg	430	U	479	U	416	U	574	U
PENTACHLOROPHENOL	ug/Kg	1290	U	1440	U	1250	U	1720	U
PHENANTHRENE	ug/Kg	430	U	27.6	J	272	J	574	U
PHENOL	ug/Kg	430	U	479	U	416	U	574	U
PYRENE	ug/Kg	430	U	258	J	603	=	574	U

Analytical Data Summary

	StationID	NDW06SS15		NDW06SS16		NDW06SS17		NDW06SS18	
	SampleID	NDW06SS15-R01		NDW06SS16-R01		NDW06SS17-R01		NDW06SS18-R01	
	Date Collected	08/28/03		08/28/03		08/28/03		08/28/03	
	SampleType	N		N		N		N	
Parameter	Units								
BENZO(k)FLUORANTHENE	ug/Kg	597	U	575	U	552	U	173	J
BENZYL BUTYL PHTHALATE	ug/Kg	597	U	575	U	552	U	569	U
BIPHENYL (DIPHENYL)	ug/Kg	597	U	575	U	552	U	569	U
bis(2-CHLOROETHOXY) METHANE	ug/Kg	597	U	575	U	552	U	569	U
bis(2-CHLOROETHYL) ETHER (2-CHLOROETHYL ETHER)	ug/Kg	597	U	575	U	552	U	569	U
bis(2-CHLOROISOPROPYL) ETHER	ug/Kg	597	U	575	U	552	U	569	U
bis(2-ETHYLHEXYL) PHTHALATE	ug/Kg	597	U	575	U	552	U	569	U
CAPROLACTAM	ug/Kg	597	U	575	U	552	U	569	U
CARBAZOLE	ug/Kg	597	U	575	U	552	U	569	U
CHRYSENE	ug/Kg	597	U	575	U	552	U	270	J
CRESOLS, m & p	ug/Kg								
DI-n-BUTYL PHTHALATE	ug/Kg	597	U	575	U	552	U	569	U
DI-n-OCTYLPHTHALATE	ug/Kg	597	U	575	U	552	U	569	U
DIBENZ(a,h)ANTHRACENE	ug/Kg	597	U	575	U	552	U	569	U
DIBENZOFURAN	ug/Kg	597	U	575	U	552	U	569	U
DIETHYL PHTHALATE	ug/Kg	597	U	575	U	552	U	569	U
DIMETHYL PHTHALATE	ug/Kg	597	U	575	U	552	U	569	U
FLUORANTHENE	ug/Kg	597	U	575	U	552	U	445	J
FLUORENE	ug/Kg	597	U	575	U	552	U	569	U
HEXACHLOROBENZENE	ug/Kg	597	U	575	U	552	U	569	U
HEXACHLOROBUTADIENE	ug/Kg	597	U	575	U	552	U	569	U
HEXACHLOROCYCLOPENTADIENE	ug/Kg	597	U	575	U	552	U	569	U
HEXACHLOROETHANE	ug/Kg	597	U	575	U	552	U	569	U
INDENO(1,2,3-c,d)PYRENE	ug/Kg	597	U	575	U	552	U	130	J
ISOPHORONE	ug/Kg	597	U	575	U	552	U	569	U
N-NITROSODI-n-PROPYLAMINE	ug/Kg	597	U	575	U	552	U	569	U
N-NITROSODIPHENYLAMINE	ug/Kg	597	U	575	U	552	U	569	U
NAPHTHALENE	ug/Kg	597	U	575	U	552	U	569	U
NITROBENZENE	ug/Kg	597	U	575	U	552	U	569	U
PENTACHLOROPHENOL	ug/Kg	1790	U	1720	U	1660	U	1710	U
PHENANTHRENE	ug/Kg	597	U	575	U	552	U	569	U
PHENOL	ug/Kg	597	U	575	U	552	U	569	U
PYRENE	ug/Kg	597	U	575	U	552	U	372	J

Analytical Data Summary

	StationID	NDW06SS19		NDW06SS20		NDW06SS21		NDW06SS22	
	SampleID	NDW06SS19-R01		NDW06SS20-R01		NDW06SS21-R01		NDW06SS22-R01	
	Date Collected	08/28/03		08/28/03		08/28/03		08/28/03	
	SampleType	N		N		N		N	
Parameter	Units								
BENZO(k)FLUORANTHENE	ug/Kg	555	U	473	U	431	U	430	U
BENZYL BUTYL PHTHALATE	ug/Kg	555	U	473	U	431	U	430	U
BIPHENYL (DIPHENYL)	ug/Kg	555	U	473	U	431	U	430	U
bis(2-CHLOROETHOXY) METHANE	ug/Kg	555	U	473	U	431	U	430	U
bis(2-CHLOROETHYL) ETHER (2-CHLOROETHYL ETHER)	ug/Kg	555	U	473	U	431	U	430	U
bis(2-CHLOROISOPROPYL) ETHER	ug/Kg	555	U	473	U	431	U	430	U
bis(2-ETHYLHEXYL) PHTHALATE	ug/Kg	555	U	473	U	431	U	430	U
CAPROLACTAM	ug/Kg	555	U	473	U	431	U	430	U
CARBAZOLE	ug/Kg	555	U	473	U	431	U	430	U
CHRYSENE	ug/Kg	35.8	J	473	U	431	U	430	U
CRESOLS, m & p	ug/Kg								
DI-n-BUTYL PHTHALATE	ug/Kg	555	U	473	U	431	U	430	U
DI-n-OCTYLPHTHALATE	ug/Kg	555	U	473	U	431	U	430	U
DIBENZ(a,h)ANTHRACENE	ug/Kg	555	U	473	U	431	U	430	U
DIBENZOFURAN	ug/Kg	555	U	473	U	431	U	430	U
DIETHYL PHTHALATE	ug/Kg	555	U	473	U	431	U	430	U
DIMETHYL PHTHALATE	ug/Kg	555	U	473	U	431	U	430	U
FLUORANTHENE	ug/Kg	41.2	J	473	U	431	U	430	U
FLUORENE	ug/Kg	555	U	473	U	431	U	430	U
HEXACHLOROBENZENE	ug/Kg	555	U	473	U	431	U	430	U
HEXACHLOROBUTADIENE	ug/Kg	555	U	473	U	431	U	430	U
HEXACHLOROCYCLOPENTADIENE	ug/Kg	555	U	473	U	431	U	430	U
HEXACHLOROETHANE	ug/Kg	555	U	473	U	431	U	430	U
INDENO(1,2,3-c,d)PYRENE	ug/Kg	555	U	473	U	431	U	430	U
ISOPHORONE	ug/Kg	555	U	473	U	431	U	430	U
N-NITROSODI-n-PROPYLAMINE	ug/Kg	555	U	473	U	431	U	430	U
N-NITROSODIPHENYLAMINE	ug/Kg	555	U	473	U	431	U	430	U
NAPHTHALENE	ug/Kg	555	U	473	U	431	U	430	U
NITROBENZENE	ug/Kg	555	U	473	U	431	U	430	U
PENTACHLOROPHENOL	ug/Kg	1660	U	1420	U	1290	U	1290	U
PHENANTHRENE	ug/Kg	555	U	473	U	431	U	430	U
PHENOL	ug/Kg	555	U	473	U	431	U	430	U
PYRENE	ug/Kg	40.9	J	473	U	431	U	430	U

Analytical Data Summary

Parameter	Units	StationID: NDW06SS23	
		SampleID: NDW06SS23-R01	
		Date Collected: 08/28/03	
		SampleType: N	
BENZO(k)FLUORANTHENE	ug/Kg	41.7	J
BENZYL BUTYL PHTHALATE	ug/Kg	434	U
BIPHENYL (DIPHENYL)	ug/Kg	434	U
bis(2-CHLOROETHOXY) METHANE	ug/Kg	434	U
bis(2-CHLOROETHYL) ETHER (2-CHLOROETHYL ETHER)	ug/Kg	434	U
bis(2-CHLOROISOPROPYL) ETHER	ug/Kg	434	U
bis(2-ETHYLHEXYL) PHTHALATE	ug/Kg	434	U
CAPROLACTAM	ug/Kg	434	U
CARBAZOLE	ug/Kg	434	U
CHRYSENE	ug/Kg	35.9	J
CRESOLS, m & p	ug/Kg		
DI-n-BUTYL PHTHALATE	ug/Kg	434	U
DI-n-OCTYLPHTHALATE	ug/Kg	434	U
DIBENZ(a,h)ANTHRACENE	ug/Kg	434	U
DIBENZOFURAN	ug/Kg	434	U
DIETHYL PHTHALATE	ug/Kg	434	U
DIMETHYL PHTHALATE	ug/Kg	434	U
FLUORANTHENE	ug/Kg	32.2	J
FLUORENE	ug/Kg	434	U
HEXACHLOROBENZENE	ug/Kg	434	U
HEXACHLOROBUTADIENE	ug/Kg	434	U
HEXACHLOROCYCLOPENTADIENE	ug/Kg	434	U
HEXACHLOROETHANE	ug/Kg	434	U
INDENO(1,2,3-c,d)PYRENE	ug/Kg	434	U
ISOPHORONE	ug/Kg	434	U
N-NITROSODI-n-PROPYLAMINE	ug/Kg	434	U
N-NITROSODIPHENYLAMINE	ug/Kg	434	U
NAPHTHALENE	ug/Kg	434	U
NITROBENZENE	ug/Kg	434	U
PENTACHLOROPHENOL	ug/Kg	1300	U
PHENANTHRENE	ug/Kg	31.1	J
PHENOL	ug/Kg	434	U
PYRENE	ug/Kg	47.6	J

Analytical Data Summary

	StationID	W6-SB06		W6-SB07		W6-SB08		W6-SB01	
	SampleID	NDA113		NDA115		NDA117		NDA101	
	Date Collected	04/20/00		04/20/00		04/20/00		04/24/00	
	SampleType	N		N		N		N	
Parameter	Units								
ACETONE	ug/Kg	10	R	20	R	11	R	20	R
BROMODICHLOROMETHANE	ug/Kg	10	U	10	U	10	UJ	14	U
BROMOMETHANE	ug/Kg	10	U	10	U	10	UJ	14	U
BENZENE	ug/Kg	10	U	10	U	10	UJ	14	U
TOLUENE	ug/Kg	10	U	10	U	0.8	J	14	U
CARBON DISULFIDE	ug/Kg	10	U	10	U	10	UJ	2	J
METHYLCYCLOHEXANE	ug/Kg								
CHLOROBENZENE	ug/Kg	10	U	10	U	10	UJ	14	U
CHLOROETHANE	ug/Kg	10	U	10	U	10	UJ	14	U
CHLOROMETHANE	ug/Kg	10	U	10	U	10	UJ	14	U
CARBON TETRACHLORIDE	ug/Kg	10	U	10	U	10	UJ	14	U
CYCLOHEXANE	ug/Kg								
DIBROMOCHLOROMETHANE	ug/Kg	10	U	10	U	10	UJ	14	U
1,2-DIBROMO-3-CHLOROPROPANE	ug/Kg								
1,1-DICHLOROETHANE	ug/Kg	10	U	10	U	10	UJ	14	U
1,2-DICHLOROETHANE	ug/Kg	10	U	10	U	10	UJ	14	U
1,2-DICHLOROBENZENE	ug/Kg								
1,3-DICHLOROBENZENE	ug/Kg								
1,4-DICHLOROBENZENE	ug/Kg								
1,1-DICHLOROETHENE	ug/Kg	10	U	10	U	10	UJ	14	U
cis-1,2-DICHLOROETHYLENE	ug/Kg								
trans-1,2-DICHLOROETHENE	ug/Kg								
cis-1,3-DICHLOROPROPENE	ug/Kg	10	U	10	U	10	UJ	14	U
trans-1,3-DICHLOROPROPENE	ug/Kg	10	U	10	U	10	UJ	14	U
1,2-DICHLOROPROPANE	ug/Kg	10	U	10	U	10	UJ	14	U
ETHYLBENZENE	ug/Kg	10	U	10	U	1	J	14	U
1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	ug/Kg								
TRICHLOROFLUOROMETHANE	ug/Kg								
1,1,2-TRICHLORO-1,2,2-TRIFLUOROETHANE	ug/Kg								
DICHLORODIFLUOROMETHANE	ug/Kg								
2-HEXANONE	ug/Kg	10	U	10	U	10	UJ	14	U
ISOPROPYLBENZENE (CUMENE)	ug/Kg								
METHYL ACETATE	ug/Kg								
METHYL ETHYL KETONE (2-BUTANONE)	ug/Kg	10	R	10	R	10	R	3	J
METHYL ISOBUTYL KETONE (4-METHYL-2-PENTANONE)	ug/Kg	10	U	10	U	10	UJ	14	U
METHYLENE CHLORIDE	ug/Kg	10	U	10	U	10	UJ	14	U
1,1,2,2-TETRACHLOROETHANE	ug/Kg	10	U	10	U	10	UJ	14	U

Analytical Data Summary

	StationID	W6-SB02		W6-SB02		W6-SB03		W6-SB04		W6-SB05	
	SampleID	NDA103		NDA104FD1		NDA107		NDA109		NDA111	
	Date Collected	04/24/00		04/24/00		04/24/00		04/24/00		04/24/00	
	SampleType	N		FD		N		N		N	
Parameter	Units										
ACETONE	ug/Kg	25	R	14	R	12	R	11	R	12	R
BROMODICHLOROMETHANE	ug/Kg	13	U	14	U	12	U	11	U	12	U
BROMOMETHANE	ug/Kg	13	U	14	U	12	U	11	U	12	U
BENZENE	ug/Kg	13	U	14	U	12	U	11	U	12	U
TOLUENE	ug/Kg	13	U	14	U	12	U	11	U	12	U
CARBON DISULFIDE	ug/Kg	2	J	14	U	12	U	11	U	0.7	J
METHYLCYCLOHEXANE	ug/Kg										
CHLOROBENZENE	ug/Kg	13	U	14	U	12	U	11	U	12	U
CHLOROETHANE	ug/Kg	13	U	14	U	12	U	11	U	12	U
CHLOROMETHANE	ug/Kg	13	U	14	U	12	U	11	U	12	U
CARBON TETRACHLORIDE	ug/Kg	13	U	14	U	12	U	11	U	12	U
CYCLOHEXANE	ug/Kg										
DIBROMOCHLOROMETHANE	ug/Kg	13	U	14	U	12	U	11	U	12	U
1,2-DIBROMO-3-CHLOROPROPANE	ug/Kg										
1,1-DICHLOROETHANE	ug/Kg	13	U	14	U	12	U	11	U	12	U
1,2-DICHLOROETHANE	ug/Kg	13	U	14	U	12	U	11	U	12	U
1,2-DICHLOROBENZENE	ug/Kg										
1,3-DICHLOROBENZENE	ug/Kg										
1,4-DICHLOROBENZENE	ug/Kg										
1,1-DICHLOROETHENE	ug/Kg	13	U	14	U	12	U	11	U	12	U
cis-1,2-DICHLOROETHYLENE	ug/Kg										
trans-1,2-DICHLOROETHENE	ug/Kg										
cis-1,3-DICHLOROPROPENE	ug/Kg	13	U	14	U	12	U	11	U	12	U
trans-1,3-DICHLOROPROPENE	ug/Kg	13	U	14	U	12	U	11	U	12	U
1,2-DICHLOROPROPANE	ug/Kg	13	U	14	U	12	U	11	U	12	U
ETHYLBENZENE	ug/Kg	13	U	14	U	12	U	11	U	12	U
1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	ug/Kg										
TRICHLOROFLUOROMETHANE	ug/Kg										
1,1,2-TRICHLORO-1,2,2-TRIFLUOROETHANE	ug/Kg										
DICHLORODIFLUOROMETHANE	ug/Kg										
2-HEXANONE	ug/Kg	13	U	14	U	12	U	11	U	12	U
ISOPROPYLBENZENE (CUMENE)	ug/Kg										
METHYL ACETATE	ug/Kg										
METHYL ETHYL KETONE (2-BUTANONE)	ug/Kg	13	R	14	R	12	R	11	R	12	R
METHYL ISOBUTYL KETONE (4-METHYL-2-PENTANONE)	ug/Kg	13	U	14	U	12	U	11	U	12	U
METHYLENE CHLORIDE	ug/Kg	13	U	14	U	12	U	11	U	12	U
1,1,2,2-TETRACHLOROETHANE	ug/Kg	13	U	14	U	12	U	11	U	12	U

Analytical Data Summary

	StationID	NDW06SS09		NDW06SS09		NDW06SS10		NDW06SS11		NDW06SS12	
	SampleID	NDW06FD04P-R01		NDW06SS09-R01		NDW06SS10-R01		NDW06SS11-R01		NDW06SS12-R01	
	Date Collected	08/28/03		08/28/03		08/28/03		08/28/03		08/28/03	
	SampleType	FD		N		N		N		N	
Parameter	Units										
ACETONE	ug/Kg	11.4	U	12	UJ	12.9	U	12.4	UJ	13.7	UJ
BROMODICHLOROMETHANE	ug/Kg	11.4	U	12	U	12.9	U	12.4	U	13.7	U
BROMOMETHANE	ug/Kg	11.4	U	12	U	12.9	U	12.4	U	13.7	U
BENZENE	ug/Kg	11.4	U	12	U	12.9	U	12.4	U	13.7	U
TOLUENE	ug/Kg	11.4	U	12	U	12.9	U	12.4	U	13.7	U
CARBON DISULFIDE	ug/Kg	11.4	U	12	U	12.9	U	12.4	U	13.7	U
METHYLCYCLOHEXANE	ug/Kg	11.4	U	12	U	12.9	U	12.4	U	13.7	U
CHLOROBENZENE	ug/Kg	11.4	U	12	U	12.9	U	12.4	U	13.7	U
CHLOROETHANE	ug/Kg	11.4	U	12	U	12.9	U	12.4	U	13.7	U
CHLOROMETHANE	ug/Kg	11.4	U	12	U	12.9	U	12.4	U	13.7	U
CARBON TETRACHLORIDE	ug/Kg	11.4	U	12	U	12.9	U	12.4	U	13.7	U
CYCLOHEXANE	ug/Kg	11.4	U	12	U	12.9	U	12.4	U	13.7	U
DIBROMOCHLOROMETHANE	ug/Kg	11.4	U	12	U	12.9	U	12.4	U	13.7	U
1,2-DIBROMO-3-CHLOROPROPANE	ug/Kg	11.4	U	12	U	12.9	U	12.4	U	13.7	U
1,1-DICHLOROETHANE	ug/Kg	11.4	U	12	U	12.9	U	12.4	U	13.7	U
1,2-DICHLOROETHANE	ug/Kg	11.4	U	12	U	12.9	U	12.4	U	13.7	U
1,2-DICHLOROBENZENE	ug/Kg	11.4	U	12	U	12.9	U	12.4	U	13.7	U
1,3-DICHLOROBENZENE	ug/Kg	11.4	U	12	U	12.9	U	12.4	U	13.7	U
1,4-DICHLOROBENZENE	ug/Kg	11.4	U	12	U	12.9	U	12.4	U	13.7	U
1,1-DICHLOROETHENE	ug/Kg	11.4	U	12	U	12.9	U	12.4	U	13.7	U
cis-1,2-DICHLOROETHYLENE	ug/Kg	11.4	U	12	U	12.9	U	12.4	U	13.7	U
trans-1,2-DICHLOROETHENE	ug/Kg	11.4	U	12	U	12.9	U	12.4	U	13.7	U
cis-1,3-DICHLOROPROPENE	ug/Kg	11.4	U	12	U	12.9	U	12.4	U	13.7	U
trans-1,3-DICHLOROPROPENE	ug/Kg	11.4	U	12	U	12.9	U	12.4	U	13.7	U
1,2-DICHLOROPROPANE	ug/Kg	11.4	U	12	U	12.9	U	12.4	U	13.7	U
ETHYLBENZENE	ug/Kg	11.4	U	12	U	12.9	U	12.4	U	13.7	U
1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	ug/Kg	11.4	U	12	U	12.9	U	12.4	U	13.7	U
TRICHLOROFLUOROMETHANE	ug/Kg	11.4	U	12	U	12.9	U	12.4	U	13.7	U
1,1,2-TRICHLORO-1,2,2-TRIFLUOROETHANE	ug/Kg	11.4	U	12	U	12.9	U	12.4	U	13.7	U
DICHLORODIFLUOROMETHANE	ug/Kg	11.4	U	12	U	12.9	U	12.4	U	13.7	U
2-HEXANONE	ug/Kg	11.4	U	12	U	12.9	U	12.4	U	13.7	U
ISOPROPYLBENZENE (CUMENE)	ug/Kg	11.4	U	12	U	12.9	U	12.4	U	13.7	U
METHYL ACETATE	ug/Kg	11.4	U	12	U	12.9	U	12.4	U	13.7	U
METHYL ETHYL KETONE (2-BUTANONE)	ug/Kg	11.4	U	12	U	12.9	U	12.4	U	13.7	U
METHYL ISOBUTYL KETONE (4-METHYL-2-PENTANONE)	ug/Kg	11.4	U	12	U	12.9	U	12.4	U	13.7	U
METHYLENE CHLORIDE	ug/Kg	11.4	U	12	U	12.9	U	12.4	U	13.7	U
1,1,2,2-TETRACHLOROETHANE	ug/Kg	11.4	U	12	U	12.9	U	12.4	U	13.7	U

Analytical Data Summary

	StationID	NDW06SS13		NDW06SS14		NDW06SS15		NDW06SS16		NDW06SS17	
	SampleID	NDW06SS13-R01		NDW06SS14-R01		NDW06SS15-R01		NDW06SS16-R01		NDW06SS17-R01	
	Date Collected	08/28/03		08/28/03		08/28/03		08/28/03		08/28/03	
	SampleType	N		N		N		N		N	
Parameter	Units										
ACETONE	ug/Kg	10.7	UJ	1330	J	19.8	UJ	20.5	UJ	20.6	UJ
BROMODICHLOROMETHANE	ug/Kg	10.7	U	18.1	U	19.8	U	20.5	U	20.6	U
BROMOMETHANE	ug/Kg	10.7	U	18.1	U	19.8	U	20.5	U	20.6	U
BENZENE	ug/Kg	10.7	U	18.1	U	19.8	U	20.5	U	20.6	U
TOLUENE	ug/Kg	10.7	U	18.1	U	19.8	U	20.5	U	20.6	U
CARBON DISULFIDE	ug/Kg	10.7	U	18.1	U	1.3	J	20.5	U	20.6	U
METHYLCYCLOHEXANE	ug/Kg	10.7	U	18.1	U	19.8	U	20.5	U	20.6	U
CHLOROBENZENE	ug/Kg	10.7	U	18.1	U	19.8	U	20.5	U	20.6	U
CHLOROETHANE	ug/Kg	10.7	U	18.1	U	19.8	U	20.5	U	20.6	U
CHLOROMETHANE	ug/Kg	10.7	U	18.1	U	19.8	U	20.5	U	20.6	U
CARBON TETRACHLORIDE	ug/Kg	10.7	U	18.1	U	19.8	U	20.5	U	20.6	U
CYCLOHEXANE	ug/Kg	10.7	U	18.1	U	19.8	U	20.5	U	20.6	U
DIBROMOCHLOROMETHANE	ug/Kg	10.7	U	18.1	U	19.8	U	20.5	U	20.6	U
1,2-DIBROMO-3-CHLOROPROPANE	ug/Kg	10.7	U	18.1	U	19.8	U	20.5	U	20.6	U
1,1-DICHLOROETHANE	ug/Kg	10.7	U	18.1	U	19.8	U	20.5	U	20.6	U
1,2-DICHLOROETHANE	ug/Kg	10.7	U	18.1	U	19.8	U	20.5	U	20.6	U
1,2-DICHLOROBENZENE	ug/Kg	10.7	U	18.1	U	19.8	U	20.5	U	20.6	U
1,3-DICHLOROBENZENE	ug/Kg	10.7	U	18.1	U	19.8	U	20.5	U	20.6	U
1,4-DICHLOROBENZENE	ug/Kg	10.7	U	18.1	U	19.8	U	20.5	U	20.6	U
1,1-DICHLOROETHENE	ug/Kg	10.7	U	18.1	U	19.8	U	20.5	U	20.6	U
cis-1,2-DICHLOROETHYLENE	ug/Kg	10.7	U	18.1	U	19.8	U	20.5	U	20.6	U
trans-1,2-DICHLOROETHENE	ug/Kg	10.7	U	18.1	U	19.8	U	20.5	U	20.6	U
cis-1,3-DICHLOROPROPENE	ug/Kg	10.7	U	18.1	U	19.8	U	20.5	U	20.6	U
trans-1,3-DICHLOROPROPENE	ug/Kg	10.7	U	18.1	U	19.8	U	20.5	U	20.6	U
1,2-DICHLOROPROPANE	ug/Kg	10.7	U	18.1	U	19.8	U	20.5	U	20.6	U
ETHYLBENZENE	ug/Kg	10.7	U	18.1	U	19.8	U	20.5	U	20.6	U
1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	ug/Kg	10.7	U	18.1	U	19.8	U	20.5	U	20.6	U
TRICHLOROFLUOROMETHANE	ug/Kg	10.7	U	18.1	U	19.8	U	20.5	U	20.6	U
1,1,2-TRICHLORO-1,2,2-TRIFLUOROETHANE	ug/Kg	10.7	U	18.1	U	19.8	U	20.5	U	20.6	U
DICHLORODIFLUOROMETHANE	ug/Kg	10.7	U	18.1	U	19.8	U	20.5	U	20.6	U
2-HEXANONE	ug/Kg	10.7	U	18.1	U	19.8	U	20.5	U	20.6	U
ISOPROPYLBENZENE (CUMENE)	ug/Kg	10.7	U	18.1	U	19.8	U	20.5	U	20.6	U
METHYL ACETATE	ug/Kg	10.7	U	18.1	U	19.8	U	20.5	U	20.6	U
METHYL ETHYL KETONE (2-BUTANONE)	ug/Kg	10.7	U	18.1	U	19.8	U	20.5	U	20.6	U
METHYL ISOBUTYL KETONE (4-METHYL-2-PENTANONE)	ug/Kg	10.7	U	18.1	U	19.8	U	20.5	U	20.6	U
METHYLENE CHLORIDE	ug/Kg	10.7	U	1.4	J	19.8	U	1.5	J	20.6	U
1,1,2,2-TETRACHLOROETHANE	ug/Kg	10.7	U	18.1	U	19.8	U	20.5	U	20.6	U

Analytical Data Summary

	StationID	NDW06SS18		NDW06SS19		NDW06SS20		NDW06SS21		NDW06SS22	
	SampleID	NDW06SS18-R01		NDW06SS19-R01		NDW06SS20-R01		NDW06SS21-R01		NDW06SS22-R01	
	Date Collected	08/28/03		08/28/03		08/28/03		08/28/03		08/28/03	
	SampleType	N		N		N		N		N	
Parameter	Units										
ACETONE	ug/Kg	22.1	U	19.6	U	16.8	U	13.4	U	12.4	U
BROMODICHLOROMETHANE	ug/Kg	22.1	U	19.6	U	16.8	U	13.4	U	12.4	U
BROMOMETHANE	ug/Kg	22.1	U	19.6	U	16.8	U	13.4	U	12.4	U
BENZENE	ug/Kg	22.1	U	19.6	U	16.8	U	13.4	U	12.4	U
TOLUENE	ug/Kg	22.1	U	19.6	U	16.8	U	13.4	U	12.4	U
CARBON DISULFIDE	ug/Kg	1.5	J	19.6	U	16.8	U	13.4	U	12.4	U
METHYLCYCLOHEXANE	ug/Kg	22.1	U	19.6	U	16.8	U	13.4	U	12.4	U
CHLOROBENZENE	ug/Kg	22.1	U	19.6	U	16.8	U	13.4	U	12.4	U
CHLOROETHANE	ug/Kg	22.1	U	19.6	U	16.8	U	13.4	U	12.4	U
CHLOROMETHANE	ug/Kg	22.1	U	19.6	U	16.8	U	13.4	U	12.4	U
CARBON TETRACHLORIDE	ug/Kg	22.1	U	19.6	U	16.8	U	13.4	U	12.4	U
CYCLOHEXANE	ug/Kg	22.1	U	19.6	U	16.8	U	13.4	U	12.4	U
DIBROMOCHLOROMETHANE	ug/Kg	22.1	U	19.6	U	16.8	U	13.4	U	12.4	U
1,2-DIBROMO-3-CHLOROPROPANE	ug/Kg	22.1	U	19.6	U	16.8	U	13.4	U	12.4	U
1,1-DICHLOROETHANE	ug/Kg	22.1	U	19.6	U	16.8	U	13.4	U	12.4	U
1,2-DICHLOROETHANE	ug/Kg	22.1	U	19.6	U	16.8	U	13.4	U	12.4	U
1,2-DICHLOROBENZENE	ug/Kg	22.1	U	19.6	U	16.8	U	13.4	U	12.4	U
1,3-DICHLOROBENZENE	ug/Kg	22.1	U	19.6	U	16.8	U	13.4	U	12.4	U
1,4-DICHLOROBENZENE	ug/Kg	22.1	U	19.6	U	16.8	U	13.4	U	12.4	U
1,1-DICHLOROETHENE	ug/Kg	22.1	U	19.6	U	16.8	U	13.4	U	12.4	U
cis-1,2-DICHLOROETHYLENE	ug/Kg	22.1	U	19.6	U	16.8	U	13.4	U	12.4	U
trans-1,2-DICHLOROETHENE	ug/Kg	22.1	U	19.6	U	16.8	U	13.4	U	12.4	U
cis-1,3-DICHLOROPROPENE	ug/Kg	22.1	U	19.6	U	16.8	U	13.4	U	12.4	U
trans-1,3-DICHLOROPROPENE	ug/Kg	22.1	U	19.6	U	16.8	U	13.4	U	12.4	U
1,2-DICHLOROPROPANE	ug/Kg	22.1	U	19.6	U	16.8	U	13.4	U	12.4	U
ETHYLBENZENE	ug/Kg	22.1	U	19.6	U	16.8	U	13.4	U	12.4	U
1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	ug/Kg	22.1	U	19.6	U	16.8	U	13.4	U	12.4	U
TRICHLOROFLUOROMETHANE	ug/Kg	22.1	U	19.6	U	16.8	U	13.4	U	12.4	U
1,1,2-TRICHLORO-1,2,2-TRIFLUOROETHANE	ug/Kg	22.1	U	19.6	U	16.8	U	13.4	U	12.4	U
DICHLORODIFLUOROMETHANE	ug/Kg	22.1	U	19.6	U	16.8	U	13.4	U	12.4	U
2-HEXANONE	ug/Kg	22.1	U	19.6	U	16.8	U	13.4	U	12.4	U
ISOPROPYLBENZENE (CUMENE)	ug/Kg	22.1	U	19.6	U	16.8	U	13.4	U	12.4	U
METHYL ACETATE	ug/Kg	22.1	U	19.6	U	16.8	U	13.4	U	12.4	U
METHYL ETHYL KETONE (2-BUTANONE)	ug/Kg	22.1	U	19.6	U	16.8	U	13.4	U	12.4	U
METHYL ISOBUTYL KETONE (4-METHYL-2-PENTANONE)	ug/Kg	22.1	U	19.6	U	16.8	U	13.4	U	12.4	U
METHYLENE CHLORIDE	ug/Kg	22.1	U	19.6	U	16.8	U	13.4	U	12.4	U
1,1,2,2-TETRACHLOROETHANE	ug/Kg	22.1	U	19.6	U	16.8	U	13.4	U	12.4	U

Analytical Data Summary

	StationID	NDW06SS23	
	SampleID	NDW06SS23-R01	
	Date Collected	08/28/03	
	SampleType	N	
Parameter	Units		
ACETONE	ug/Kg	11.1	UJ
BROMODICHLOROMETHANE	ug/Kg	11.1	U
BROMOMETHANE	ug/Kg	11.1	U
BENZENE	ug/Kg	11.1	U
TOLUENE	ug/Kg	11.1	U
CARBON DISULFIDE	ug/Kg	11.1	U
METHYLCYCLOHEXANE	ug/Kg	11.1	U
CHLOROBENZENE	ug/Kg	11.1	U
CHLOROETHANE	ug/Kg	11.1	U
CHLOROMETHANE	ug/Kg	11.1	U
CARBON TETRACHLORIDE	ug/Kg	11.1	U
CYCLOHEXANE	ug/Kg	11.1	U
DIBROMOCHLOROMETHANE	ug/Kg	11.1	U
1,2-DIBROMO-3-CHLOROPROPANE	ug/Kg	11.1	U
1,1-DICHLOROETHANE	ug/Kg	11.1	U
1,2-DICHLOROETHANE	ug/Kg	11.1	U
1,2-DICHLOROBENZENE	ug/Kg	11.1	U
1,3-DICHLOROBENZENE	ug/Kg	11.1	U
1,4-DICHLOROBENZENE	ug/Kg	11.1	U
1,1-DICHLOROETHENE	ug/Kg	11.1	U
cis-1,2-DICHLOROETHYLENE	ug/Kg	11.1	U
trans-1,2-DICHLOROETHENE	ug/Kg	11.1	U
cis-1,3-DICHLOROPROPENE	ug/Kg	11.1	U
trans-1,3-DICHLOROPROPENE	ug/Kg	11.1	U
1,2-DICHLOROPROPANE	ug/Kg	11.1	U
ETHYLBENZENE	ug/Kg	11.1	U
1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	ug/Kg	11.1	U
TRICHLOROFLUOROMETHANE	ug/Kg	11.1	U
1,1,2-TRICHLORO-1,2,2-TRIFLUOROETHANE	ug/Kg	11.1	U
DICHLORODIFLUOROMETHANE	ug/Kg	11.1	U
2-HEXANONE	ug/Kg	11.1	U
ISOPROPYLBENZENE (CUMENE)	ug/Kg	11.1	U
METHYL ACETATE	ug/Kg	11.1	U
METHYL ETHYL KETONE (2-BUTANONE)	ug/Kg	11.1	U
METHYL ISOBUTYL KETONE (4-METHYL-2-PENTANONE)	ug/Kg	11.1	U
METHYLENE CHLORIDE	ug/Kg	0.65	J
1,1,2,2-TETRACHLOROETHANE	ug/Kg	11.1	U

Analytical Data Summary

	StationID	W6-SB06		W6-SB07		W6-SB08		W6-SB01	
	SampleID	NDA113		NDA115		NDA117		NDA101	
	Date Collected	04/20/00		04/20/00		04/20/00		04/24/00	
	SampleType	N		N		N		N	
Parameter	Units								
TETRACHLOROETHYLENE(PCE)	ug/Kg	10	U	10	U	10	UJ	14	U
STYRENE	ug/Kg	10	U	10	U	10	UJ	14	U
BROMOFORM	ug/Kg	10	U	10	U	10	UJ	14	U
tert-BUTYL METHYL ETHER	ug/Kg								
1,1,1-TRICHLOROETHANE	ug/Kg	10	U	10	U	10	UJ	14	U
1,1,2-TRICHLOROETHANE	ug/Kg	10	U	10	U	10	UJ	14	U
1,2,4-TRICHLOROBENZENE	ug/Kg								
TRICHLOROETHYLENE (TCE)	ug/Kg	10	U	10	U	10	UJ	14	U
CHLOROFORM	ug/Kg	10	U	10	U	10	UJ	14	U
VINYL CHLORIDE	ug/Kg	10	U	10	U	10	UJ	14	U
XYLENES, TOTAL	ug/Kg	10	U	10	U	6	J	0.7	J
M,P-XYLENE (SUM OF ISOMERS)	ug/Kg	10	U	10	U	4	J	0.7	J
O-XYLENE (1,2-DIMETHYLBENZENE)	ug/Kg	10	U	10	U	2	J	14	U

Analytical Data Summary

	StationID	W6-SB02		W6-SB02		W6-SB03		W6-SB04		W6-SB05	
	SampleID	NDA103		NDA104FD1		NDA107		NDA109		NDA111	
	Date Collected	04/24/00		04/24/00		04/24/00		04/24/00		04/24/00	
	SampleType	N		FD		N		N		N	
Parameter	Units										
TETRACHLOROETHYLENE(PCE)	ug/Kg	13	U	14	U	12	U	11	U	12	U
STYRENE	ug/Kg	13	U	14	U	12	U	11	U	12	U
BROMOFORM	ug/Kg	13	U	14	U	12	U	11	U	12	U
tert-BUTYL METHYL ETHER	ug/Kg										
1,1,1-TRICHLOROETHANE	ug/Kg	13	U	14	U	12	U	11	U	12	U
1,1,2-TRICHLOROETHANE	ug/Kg	13	U	14	U	12	U	11	U	12	U
1,2,4-TRICHLOROBENZENE	ug/Kg										
TRICHLOROETHYLENE (TCE)	ug/Kg	13	U	14	U	12	U	11	U	12	U
CHLOROFORM	ug/Kg	13	U	14	U	12	U	11	U	12	U
VINYL CHLORIDE	ug/Kg	13	U	14	U	12	U	11	U	12	U
XYLENES, TOTAL	ug/Kg	13	U	14	U	12	U	11	U	12	U
M,P-XYLENE (SUM OF ISOMERS)	ug/Kg	13	U	14	U	12	U	11	U	12	U
O-XYLENE (1,2-DIMETHYLBENZENE)	ug/Kg	13	U	14	U	12	U	11	U	12	U

Analytical Data Summary

	StationID	NDW06SS09		NDW06SS09		NDW06SS10		NDW06SS11		NDW06SS12	
	SampleID	NDW06FD04P-R01		NDW06SS09-R01		NDW06SS10-R01		NDW06SS11-R01		NDW06SS12-R01	
	Date Collected	08/28/03		08/28/03		08/28/03		08/28/03		08/28/03	
	SampleType	FD		N		N		N		N	
Parameter	Units										
TETRACHLOROETHYLENE(PCE)	ug/Kg	11.4	U	12	U	12.9	U	12.4	U	13.7	U
STYRENE	ug/Kg	11.4	U	12	U	12.9	U	12.4	U	13.7	U
BROMOFORM	ug/Kg	11.4	U	12	U	12.9	U	12.4	U	13.7	U
tert-BUTYL METHYL ETHER	ug/Kg	11.4	U	12	U	12.9	U	12.4	U	13.7	U
1,1,1-TRICHLOROETHANE	ug/Kg	11.4	U	12	U	12.9	U	12.4	U	13.7	U
1,1,2-TRICHLOROETHANE	ug/Kg	11.4	U	12	U	12.9	U	12.4	U	13.7	U
1,2,4-TRICHLOROBENZENE	ug/Kg	11.4	U	12	U	12.9	U	12.4	U	13.7	U
TRICHLOROETHYLENE (TCE)	ug/Kg	11.4	U	12	U	12.9	U	12.4	U	13.7	U
CHLOROFORM	ug/Kg	11.4	U	12	U	12.9	U	12.4	U	13.7	U
VINYL CHLORIDE	ug/Kg	11.4	U	12	U	12.9	U	12.4	U	13.7	U
XYLENES, TOTAL	ug/Kg	11.4	U	12	U	12.9	U	12.4	U	13.7	U
M,P-XYLENE (SUM OF ISOMERS)	ug/Kg										
O-XYLENE (1,2-DIMETHYLBENZENE)	ug/Kg										

Analytical Data Summary

	StationID	NDW06SS13		NDW06SS14		NDW06SS15		NDW06SS16		NDW06SS17	
	SampleID	NDW06SS13-R01		NDW06SS14-R01		NDW06SS15-R01		NDW06SS16-R01		NDW06SS17-R01	
	Date Collected	08/28/03		08/28/03		08/28/03		08/28/03		08/28/03	
	SampleType	N		N		N		N		N	
Parameter	Units										
TETRACHLOROETHYLENE(PCE)	ug/Kg	10.7	U	18.1	U	19.8	U	20.5	U	20.6	U
STYRENE	ug/Kg	10.7	U	18.1	U	19.8	U	20.5	U	20.6	U
BROMOFORM	ug/Kg	10.7	U	18.1	U	19.8	U	20.5	U	20.6	U
tert-BUTYL METHYL ETHER	ug/Kg	10.7	U	18.1	U	19.8	U	20.5	U	20.6	U
1,1,1-TRICHLOROETHANE	ug/Kg	10.7	U	18.1	U	19.8	U	20.5	U	20.6	U
1,1,2-TRICHLOROETHANE	ug/Kg	10.7	U	18.1	U	19.8	U	20.5	U	20.6	U
1,2,4-TRICHLOROBENZENE	ug/Kg	10.7	U	18.1	U	19.8	U	20.5	U	20.6	U
TRICHLOROETHYLENE (TCE)	ug/Kg	10.7	U	18.1	U	19.8	U	20.5	U	20.6	U
CHLOROFORM	ug/Kg	10.7	U	18.1	U	19.8	U	20.5	U	20.6	U
VINYL CHLORIDE	ug/Kg	10.7	U	18.1	U	19.8	U	20.5	U	20.6	U
XYLENES, TOTAL	ug/Kg	10.7	U	18.1	U	19.8	U	20.5	U	20.6	U
M,P-XYLENE (SUM OF ISOMERS)	ug/Kg										
O-XYLENE (1,2-DIMETHYLBENZENE)	ug/Kg										

Analytical Data Summary

	StationID	NDW06SS18		NDW06SS19		NDW06SS20		NDW06SS21		NDW06SS22	
	SampleID	NDW06SS18-R01		NDW06SS19-R01		NDW06SS20-R01		NDW06SS21-R01		NDW06SS22-R01	
	Date Collected	08/28/03		08/28/03		08/28/03		08/28/03		08/28/03	
	SampleType	N		N		N		N		N	
Parameter	Units										
TETRACHLOROETHYLENE(PCE)	ug/Kg	22.1	U	19.6	U	16.8	U	13.4	U	12.4	U
STYRENE	ug/Kg	22.1	U	19.6	U	16.8	U	13.4	U	12.4	U
BROMOFORM	ug/Kg	22.1	U	19.6	U	16.8	U	13.4	U	12.4	U
tert-BUTYL METHYL ETHER	ug/Kg	22.1	U	19.6	U	16.8	U	13.4	U	12.4	U
1,1,1-TRICHLOROETHANE	ug/Kg	22.1	U	19.6	U	16.8	U	13.4	U	12.4	U
1,1,2-TRICHLOROETHANE	ug/Kg	22.1	U	19.6	U	16.8	U	13.4	U	12.4	U
1,2,4-TRICHLOROBENZENE	ug/Kg	22.1	U	19.6	U	16.8	U	13.4	U	12.4	U
TRICHLOROETHYLENE (TCE)	ug/Kg	22.1	U	19.6	U	16.8	U	13.4	U	12.4	U
CHLOROFORM	ug/Kg	22.1	U	19.6	U	16.8	U	13.4	U	12.4	U
VINYL CHLORIDE	ug/Kg	22.1	U	19.6	U	16.8	U	13.4	U	12.4	U
XYLENES, TOTAL	ug/Kg	22.1	U	19.6	U	16.8	U	13.4	U	12.4	U
M,P-XYLENE (SUM OF ISOMERS)	ug/Kg										
O-XYLENE (1,2-DIMETHYLBENZENE)	ug/Kg										

Analytical Data Summary

	StationID	NDW06SS23	
	SampleID	NDW06SS23-R01	
	Date Collected	08/28/03	
	SampleType	N	
Parameter	Units		
TETRACHLOROETHYLENE(PCE)	ug/Kg	11.1	U
STYRENE	ug/Kg	11.1	U
BROMOFORM	ug/Kg	11.1	U
tert-BUTYL METHYL ETHER	ug/Kg	11.1	U
1,1,1-TRICHLOROETHANE	ug/Kg	11.1	U
1,1,2-TRICHLOROETHANE	ug/Kg	11.1	U
1,2,4-TRICHLOROBENZENE	ug/Kg	11.1	U
TRICHLOROETHYLENE (TCE)	ug/Kg	11.1	U
CHLOROFORM	ug/Kg	11.1	U
VINYL CHLORIDE	ug/Kg	11.1	U
XYLENES, TOTAL	ug/Kg	11.1	U
M,P-XYLENE (SUM OF ISOMERS)	ug/Kg		
O-XYLENE (1,2-DIMETHYLBENZENE)	ug/Kg		

Subsurface Soil

Analytical Data Summary

	StationID	W6-SB01		W6-SB02		W6-SB02		W6-SB03	
	SampleID	NDA102		NDA105		NDA106FD1		NDA108	
	Date Collected	04/24/00		04/24/00		04/24/00		04/24/00	
	SampleType	N		N		FD		N	
Parameter	Units								
1,3-Dinitrobenzene	ug/Kg	382	U	405	U	404	U	337	U
2,4-Dinitrotoluene	ug/Kg	382	U	405	U	404	U	337	U
2,6-Dinitrotoluene	ug/Kg	382	U	405	U	404	U	337	U
Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine	ug/Kg	382	U	405	U	404	U	337	U
2-Nitrotoluene	ug/Kg	382	U	405	U	404	U	337	U
3-Nitrotoluene	ug/Kg	382	U	405	U	404	U	337	U
4-Nitrotoluene	ug/Kg	382	U	405	U	404	U	337	U
Nitrobenzene	ug/Kg	382	U	405	U	404	U	337	U
Hexahydro-1,3,5-trinitro-1,3,5,7-tetrazocine	ug/Kg	382	U	405	U	404	U	337	U
Tetryl	ug/Kg	382	U	405	U	404	U	337	U
1,3,5-Trinitrobenzene	ug/Kg	382	U	405	U	404	U	337	U
2,4,6-trinitrotoluene	ug/Kg	382	U	405	U	404	U	337	U

Analytical Data Summary

	StationID	W6-SB04		W6-SB05		W6-SB06		W6-SB07	
	SampleID	NDA110		NDA112		NDA114		NDA116	
	Date Collected	04/24/00		04/24/00		04/20/00		04/20/00	
	SampleType	N		N		N		N	
Parameter	Units								
1,3-Dinitrobenzene	ug/Kg	188	U	334	U	322	U	314	U
2,4-Dinitrotoluene	ug/Kg	188	U	334	U	322	U	314	U
2,6-Dinitrotoluene	ug/Kg	188	U	334	U	322	U	314	U
Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine	ug/Kg	188	U	334	U	322	U	314	U
2-Nitrotoluene	ug/Kg	188	U	334	U	322	U	314	U
3-Nitrotoluene	ug/Kg	188	U	334	U	322	U	314	U
4-Nitrotoluene	ug/Kg	188	U	334	U	322	U	314	U
Nitrobenzene	ug/Kg	188	U	334	U	322	U	314	U
Hexahydro-1,3,5-trinitro-1,3,5,7-tetrazocine	ug/Kg	188	U	334	U	322	U	314	U
Tetryl	ug/Kg	188	U	334	U	322	U	314	U
1,3,5-Trinitrobenzene	ug/Kg	188	U	334	U	322	U	314	U
2,4,6-trinitrotoluene	ug/Kg	188	U	334	U	322	U	314	U

Analytical Data Summary

	StationID	W6-SB08	
	SampleID	NDA118	
	Date Collected	04/20/00	
	SampleType	N	
Parameter	Units		
1,3-Dinitrobenzene	ug/Kg	321	U
2,4-Dinitrotoluene	ug/Kg	321	U
2,6-Dinitrotoluene	ug/Kg	321	U
Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine	ug/Kg	321	U
2-Nitrotoluene	ug/Kg	321	U
3-Nitrotoluene	ug/Kg	321	U
4-Nitrotoluene	ug/Kg	321	U
Nitrobenzene	ug/Kg	321	U
Hexahydro-1,3,5-trinitro-1,3,5,7-tetrazocine	ug/Kg	321	U
Tetryl	ug/Kg	321	U
1,3,5-Trinitrobenzene	ug/Kg	321	U
2,4,6-trinitrotoluene	ug/Kg	321	U

Analytical Data Summary

	StationID	W6-SB01		W6-SB02		W6-SB02		W6-SB03	
	SampleID	NDA102		NDA105		NDA106FD1		NDA108	
	Date Collected	04/24/00		04/24/00		04/24/00		04/24/00	
	SampleType	N		N		FD		N	
Parameter	Units								
Aluminum	mg/Kg	9320	=	5860	=	5960	=	5440	=
Antimony	mg/Kg	4.1	J	0.61	J	0.5	J	0.93	J
Arsenic	mg/Kg	2.2	J	0.76	J	1.1	J	2	J
Barium	mg/Kg	20.4	J	12.9	J	12.9	J	27.9	J
Beryllium	mg/Kg	0.048	J	0.049	U	0.049	U	0.055	J
Cadmium	mg/Kg	0.44	J	0.33	J	0.55	J	0.027	U
Calcium	mg/Kg	96500	J	138000	J	212000	J	97600	J
Chromium, Total	mg/Kg	11.6	=	5.7	=	5	=	9.7	=
Cobalt	mg/Kg	3.5	J	2.1	J	2	J	4.2	J
Copper	mg/Kg	51.5	=	15	=	11.4	=	35.7	=
Iron	mg/Kg	21900	=	7330	=	6020	=	17900	=
Lead	mg/Kg	332	=	25.8	=	21.3	=	97.8	=
Magnesium	mg/Kg	5580	=	3810	=	3660	=	3130	=
Manganese	mg/Kg	227	=	117	=	87.6	=	219	=
Mercury	mg/Kg	0.053	J	0.042	J	0.023	UJ	0.072	J
Nickel	mg/Kg	5.1	J	2.3	J	2	J	4.5	J
Potassium	mg/Kg	2630	J	2670	J	2740	J	1810	J
Selenium	mg/Kg	0.33	U	0.34	U	0.34	U	0.28	U
Silver	mg/Kg	0.11	J	0.081	U	0.081	U	0.27	J
Sodium	mg/Kg	16500	=	15400	=	15800	=	6120	=
Thallium	mg/Kg	1.5	J	0.44	U	0.44	U	1.3	J
Vanadium	mg/Kg	27.9	=	20.7	=	18.6	=	27.3	=
Zinc	mg/Kg	216	=	37.5	=	22.3	=	68.1	=

Analytical Data Summary

	StationID	W6-SB04		W6-SB05		W6-SB06		W6-SB07	
	SampleID	NDA110		NDA112		NDA114		NDA116	
	Date Collected	04/24/00		04/24/00		04/20/00		04/20/00	
	SampleType	N		N		N		N	
Parameter	Units								
Aluminum	mg/Kg	10300	=	5190	=	12500	=	6470	=
Antimony	mg/Kg	0.53	J	0.19	UJ	0.46	J	0.18	UJ
Arsenic	mg/Kg	1	J	1.2	J	0.88	J	1.1	J
Barium	mg/Kg	19.3	J	12.6	J	36.9	J	24	J
Beryllium	mg/Kg	0.14	J	0.04	U	0.092	J	0.066	J
Cadmium	mg/Kg	0.48	J	0.63	J	0.29	J	0.16	J
Calcium	mg/Kg	42600	J	122000	J	102000	J	114000	J
Chromium, Total	mg/Kg	17.8	=	5.9	=	25.4	=	6.3	=
Cobalt	mg/Kg	9.4	J	1.9	J	8.2	J	2.2	J
Copper	mg/Kg	38.2	=	34.4	=	137	J	37.1	J
Iron	mg/Kg	25100	=	5910	=	15400	=	7980	=
Lead	mg/Kg	16.9	=	8.8	=	16.1	=	2.3	=
Magnesium	mg/Kg	8130	=	2920	=	5220	=	3130	=
Manganese	mg/Kg	295	=	72	=	343	J	213	J
Mercury	mg/Kg	0.012	UJ	0.018	UJ	0.018	J	0.016	U
Nickel	mg/Kg	9.7	J	1.8	J	12.4	=	1.4	J
Potassium	mg/Kg	2510	J	1590	J	1840	=	2220	=
Selenium	mg/Kg	0.28	U	0.28	U	0.27	U	0.26	U
Silver	mg/Kg	0.066	U	0.067	U	0.19	J	0.063	U
Sodium	mg/Kg	4200	=	8370	=	4790	=	5710	=
Thallium	mg/Kg	1.5	J	0.36	U	0.35	U	0.34	U
Vanadium	mg/Kg	80.2	=	19.4	=	37.1	=	20.1	=
Zinc	mg/Kg	58.1	=	23.5	=	200	=	14.5	=

Analytical Data Summary

	StationID	W6-SB08	
	SampleID	NDA118	
	Date Collected	04/20/00	
	SampleType	N	
Parameter	Units		
Aluminum	mg/Kg	7190	=
Antimony	mg/Kg	0.18	UJ
Arsenic	mg/Kg	1.1	J
Barium	mg/Kg	24.3	J
Beryllium	mg/Kg	0.072	J
Cadmium	mg/Kg	0.14	J
Calcium	mg/Kg	104000	J
Chromium, Total	mg/Kg	6.7	=
Cobalt	mg/Kg	2.2	J
Copper	mg/Kg	10	J
Iron	mg/Kg	8230	=
Lead	mg/Kg	2.8	=
Magnesium	mg/Kg	3490	=
Manganese	mg/Kg	170	J
Mercury	mg/Kg	0.016	U
Nickel	mg/Kg	1.8	J
Potassium	mg/Kg	2490	=
Selenium	mg/Kg	0.29	J
Silver	mg/Kg	0.065	U
Sodium	mg/Kg	6230	=
Thallium	mg/Kg	0.35	U
Vanadium	mg/Kg	21.1	=
Zinc	mg/Kg	14.9	=

Analytical Data Summary

	StationID	W6-SB01		W6-SB02		W6-SB02		W6-SB03		W6-SB04	
	SampleID	NDA102		NDA105		NDA106FD1		NDA108		NDA110	
	Date Collected	04/24/00		04/24/00		04/24/00		04/24/00		04/24/00	
	SampleType	N		N		FD		N		N	
Parameter	Units										
PCB-1016 (AROCHLOR 1016)	ug/Kg	51	UJ	52	UJ	52	UJ	44	UJ	44	UJ
PCB-1221 (AROCHLOR 1221)	ug/Kg	104	UJ	106	UJ	106	UJ	89	UJ	89	UJ
PCB-1232 (AROCHLOR 1232)	ug/Kg	51	UJ	52	UJ	52	UJ	44	UJ	44	UJ
PCB-1242 (AROCHLOR 1242)	ug/Kg	51	UJ	52	UJ	52	UJ	44	UJ	44	UJ
PCB-1248 (AROCHLOR 1248)	ug/Kg	51	UJ	52	UJ	52	UJ	44	UJ	44	UJ
PCB-1254 (AROCHLOR 1254)	ug/Kg	51	UJ	52	UJ	52	UJ	44	UJ	44	UJ
PCB-1260 (AROCHLOR 1260)	ug/Kg	51	UJ	52	UJ	52	UJ	44	UJ	44	UJ

Analytical Data Summary

	StationID	W6-SB05		W6-SB06		W6-SB07		W6-SB08	
	SampleID	NDA112		NDA114		NDA116		NDA118	
	Date Collected	04/24/00		04/20/00		04/20/00		04/20/00	
	SampleType	N		N		N		N	
Parameter	Units								
PCB-1016 (AROCHLOR 1016)	ug/Kg	43	UJ	43	UJ	41	UJ	42	UJ
PCB-1221 (AROCHLOR 1221)	ug/Kg	87	UJ	87	UJ	83	UJ	86	UJ
PCB-1232 (AROCHLOR 1232)	ug/Kg	43	UJ	43	UJ	41	UJ	42	UJ
PCB-1242 (AROCHLOR 1242)	ug/Kg	43	UJ	43	UJ	41	UJ	42	UJ
PCB-1248 (AROCHLOR 1248)	ug/Kg	43	UJ	43	UJ	41	UJ	42	UJ
PCB-1254 (AROCHLOR 1254)	ug/Kg	43	UJ	43	UJ	41	UJ	42	UJ
PCB-1260 (AROCHLOR 1260)	ug/Kg	43	UJ	43	UJ	41	UJ	42	UJ

Analytical Data Summary

	StationID	W6-SB01		W6-SB02		W6-SB02		W6-SB03	
	SampleID	NDA102		NDA105		NDA106FD1		NDA108	
	Date Collected	04/24/00		04/24/00		04/24/00		04/24/00	
	SampleType	N		N		FD		N	
Parameter	Units								
Aldrin	ug/Kg	2.6	UJ	2.7	UJ	2.7	UJ	2.3	UJ
Alpha bhc (alpha hexachlorocyclohexane)	ug/Kg	2.6	UJ	2.7	UJ	2.7	UJ	2.3	UJ
Beta bhc (beta hexachlorocyclohexane)	ug/Kg	2.6	UJ	2.7	UJ	2.7	UJ	2.3	UJ
Delta bhc (delta hexachlorocyclohexane)	ug/Kg	2.6	UJ	2.7	UJ	2.7	UJ	2.3	UJ
Gamma bhc (lindane)	ug/Kg	2.6	UJ	2.7	UJ	2.7	UJ	2.3	UJ
Alpha-chlordane	ug/Kg	2.6	UJ	2.7	UJ	2.7	UJ	2.3	UJ
Gamma-chlordane	ug/Kg	2.6	UJ	2.7	UJ	2.7	UJ	2.3	UJ
p,p'-DDD	ug/Kg	13	J	0.84	J	0.97	J	1	J
p,p'-DDE	ug/Kg	30	J	11	J	5.3	J	5.8	J
p,p'-DDT	ug/Kg	5.2	UJ	5.3	UJ	5.3	UJ	1.8	J
Dieldrin	ug/Kg	5.2	UJ	5.3	UJ	5.3	UJ	4.4	UJ
Alpha endosulfan	ug/Kg	2.6	UJ	2.7	UJ	2.7	UJ	2.3	UJ
Beta endosulfan	ug/Kg	5.2	UJ	5.3	UJ	5.3	UJ	4.4	UJ
Endosulfan sulfate	ug/Kg	5.2	UJ	5.3	UJ	5.3	UJ	4.4	UJ
Endrin	ug/Kg	5.2	UJ	5.3	UJ	5.3	UJ	4.4	UJ
Endrin aldehyde	ug/Kg	5.2	UJ	5.3	UJ	5.3	UJ	4.4	UJ
Endrin ketone	ug/Kg	5.2	UJ	5.3	UJ	5.3	UJ	4.4	UJ
Heptachlor epoxide	ug/Kg	2.6	UJ	2.7	UJ	2.7	UJ	2.3	UJ
Heptachlor	ug/Kg	2.6	UJ	2.7	UJ	2.7	UJ	2.3	UJ
Methoxychlor	ug/Kg	26	UJ	27	UJ	27	UJ	23	UJ
Toxaphene	ug/Kg	263	UJ	269	UJ	269	UJ	226	UJ

Analytical Data Summary

	StationID	W6-SB04		W6-SB05		W6-SB06		W6-SB07		W6-S
	SampleID	NDA110		NDA112		NDA114		NDA116		NDA
	Date Collected	04/24/00		04/24/00		04/20/00		04/20/00		04/2
	SampleType	N		N		N		N		N
Parameter	Units									
Aldrin	ug/Kg	2.3	UJ	2.2	UJ	2.2	UJ	2.1	UJ	2.2
Alpha bhc (alpha hexachlorocyclohexane)	ug/Kg	2.3	UJ	2.2	UJ	2.2	UJ	2.1	UJ	2.2
Beta bhc (beta hexachlorocyclohexane)	ug/Kg	2.3	UJ	2.2	UJ	2.2	UJ	2.1	UJ	2.2
Delta bhc (delta hexachlorocyclohexane)	ug/Kg	2.3	UJ	2.2	UJ	2.2	UJ	2.1	UJ	2.2
Gamma bhc (lindane)	ug/Kg	2.3	UJ	2.2	UJ	2.2	UJ	2.1	UJ	2.2
Alpha-chlordane	ug/Kg	2.3	UJ	2.2	UJ	2.2	UJ	2.1	UJ	2.2
Gamma-chlordane	ug/Kg	2.3	UJ	2.2	UJ	2.2	UJ	2.1	UJ	2.2
p,p'-DDD	ug/Kg	4.4	UJ	0.32	J	12	J	4.2	UJ	4.3
p,p'-DDE	ug/Kg	0.88	J	2	J	316	J	4.2	UJ	4.3
p,p'-DDT	ug/Kg	4.4	UJ	4.3	UJ	19	J	4.2	UJ	4.3
Dieldrin	ug/Kg	4.4	UJ	4.3	UJ	4.3	UJ	4.2	UJ	4.3
Alpha endosulfan	ug/Kg	2.3	UJ	2.2	UJ	2.2	UJ	2.1	UJ	2.2
Beta endosulfan	ug/Kg	4.4	UJ	4.3	UJ	4.3	UJ	4.2	UJ	4.3
Endosulfan sulfate	ug/Kg	4.4	UJ	4.3	UJ	4.3	UJ	4.2	UJ	4.3
Endrin	ug/Kg	4.4	UJ	4.3	UJ	4.3	UJ	4.2	UJ	4.3
Endrin aldehyde	ug/Kg	4.4	UJ	4.3	UJ	4.3	UJ	4.2	UJ	4.3
Endrin ketone	ug/Kg	4.4	UJ	4.3	UJ	4.3	UJ	4.2	UJ	4.3
Heptachlor epoxide	ug/Kg	2.3	UJ	2.2	UJ	2.2	UJ	2.1	UJ	2.2
Heptachlor	ug/Kg	2.3	UJ	2.2	UJ	2.2	UJ	2.1	UJ	2.2
Methoxychlor	ug/Kg	23	UJ	22	UJ	22	UJ	21	UJ	22
Toxaphene	ug/Kg	226	UJ	222	UJ	220	UJ	212	UJ	218

Analytical Data Summary

	StationID	SB08
	SampleID	118
	Date Collected	0/00
	SampleType	N
Parameter	**Units**	
Aldrin	ug/Kg	UJ
Alpha bhc (alpha hexachlorocyclohexane)	ug/Kg	UJ
Beta bhc (beta hexachlorocyclohexane)	ug/Kg	UJ
Delta bhc (delta hexachlorocyclohexane)	ug/Kg	UJ
Gamma bhc (lindane)	ug/Kg	UJ
Alpha-chlordane	ug/Kg	UJ
Gamma-chlordane	ug/Kg	UJ
p,p'-DDD	ug/Kg	UJ
p,p'-DDE	ug/Kg	UJ
p,p'-DDT	ug/Kg	UJ
Dieldrin	ug/Kg	UJ
Alpha endosulfan	ug/Kg	UJ
Beta endosulfan	ug/Kg	UJ
Endosulfan sulfate	ug/Kg	UJ
Endrin	ug/Kg	UJ
Endrin aldehyde	ug/Kg	UJ
Endrin ketone	ug/Kg	UJ
Heptachlor epoxide	ug/Kg	UJ
Heptachlor	ug/Kg	UJ
Methoxychlor	ug/Kg	UJ
Toxaphene	ug/Kg	UJ

Analytical Data Summary

	StationID	W6-SB01		W6-SB02		W6-SB02		W6-SB03	
	SampleID	NDA102		NDA105		NDA106FD1		NDA108	
	Date Collected	04/24/00		04/24/00		04/24/00		04/24/00	
	SampleType	N		N		FD		N	
Parameter	Units								
1,2,4-TRICHLOROBENZENE	ug/Kg	684	U	748	U	737	U	637	U
1,2-DICHLOROBENZENE	ug/Kg	684	U	748	U	737	U	637	U
1,3-DICHLOROBENZENE	ug/Kg	684	U	748	U	737	U	637	U
1,4-DICHLOROBENZENE	ug/Kg	684	U	748	U	737	U	637	U
2,4,5-TRICHLOROPHENOL	ug/Kg	2050	U	2240	U	2210	U	1910	U
2,4,6-TRICHLOROPHENOL	ug/Kg	684	U	748	U	737	U	637	U
2,4-DICHLOROPHENOL	ug/Kg	684	U	748	U	737	U	637	U
2,4-DIMETHYLPHENOL	ug/Kg	684	U	748	U	737	U	637	U
2,4-DINITROPHENOL	ug/Kg	2050	U	2240	U	2210	U	1910	U
2,4-DINITROTOLUENE	ug/Kg	684	U	748	U	737	U	637	U
2,6-DINITROTOLUENE	ug/Kg	684	U	748	U	737	U	637	U
2-CHLORONAPHTHALENE	ug/Kg	684	U	748	U	737	U	637	U
2-CHLOROPHENOL	ug/Kg	684	U	748	U	737	U	637	U
2-METHYLNAPHTHALENE	ug/Kg	684	U	748	U	737	U	637	U
2-METHYLPHENOL (o-CRESOL)	ug/Kg	684	U	748	U	737	U	637	U
2-NITROANILINE	ug/Kg	2050	U	2240	U	2210	U	1910	U
2-NITROPHENOL	ug/Kg	684	U	748	U	737	U	637	U
3,3'-DICHLOROBENZIDINE	ug/Kg	1370	U	1500	U	1470	U	1270	U
3-NITROANILINE	ug/Kg	2050	U	2240	U	2210	U	1910	U
4,6-DINITRO-2-METHYLPHENOL	ug/Kg	2050	U	2240	U	2210	U	1910	U
4-BROMOPHENYL PHENYL ETHER	ug/Kg	684	U	748	U	737	U	637	U
4-CHLORO-3-METHYLPHENOL	ug/Kg	684	U	748	U	737	U	637	U
4-CHLOROANILINE	ug/Kg	684	U	748	U	737	U	637	U
4-CHLOROPHENYL PHENYL ETHER	ug/Kg	684	U	748	U	737	U	637	U
4-NITROANILINE	ug/Kg	2050	U	2240	U	2210	U	1910	U
4-NITROPHENOL	ug/Kg	2050	U	2240	U	2210	U	1910	U
ACENAPHTHENE	ug/Kg	684	U	748	U	737	U	637	U
ACENAPHTHYLENE	ug/Kg	684	U	748	U	737	U	637	U
ANTHRACENE	ug/Kg	38	U	748	U	737	U	637	U
BENZO(a)ANTHRACENE	ug/Kg	100	J	748	U	737	U	637	U
BENZO(a)PYRENE	ug/Kg	123	J	748	U	737	U	637	U
BENZO(b)FLUORANTHENE	ug/Kg	81	J	748	U	737	U	33	U
BENZO(g,h,i)PERYLENE	ug/Kg	69	J	748	U	737	U	637	U
BENZO(k)FLUORANTHENE	ug/Kg	75	J	748	U	737	U	45	U
BENZYL BUTYL PHTHALATE	ug/Kg	684	U	748	U	737	U	637	U
bis(2-CHLOROETHOXY) METHANE	ug/Kg	684	U	748	U	737	U	637	U
bis(2-CHLOROETHYL) ETHER (2-CHLOROETHYL ETHER)	ug/Kg	684	U	748	U	737	U	637	U

Analytical Data Summary

	StationID	W6-SB04		W6-SB05		W6-SB06		W6-SB07	
	SampleID	NDA110		NDA112		NDA114		NDA116	
	Date Collected	04/24/00		04/24/00		04/20/00		04/20/00	
	SampleType	N		N		N		N	
Parameter	Units								
1,2,4-TRICHLOROBENZENE	ug/Kg	567	U	536	U	629	U	696	U
1,2-DICHLOROBENZENE	ug/Kg	567	U	536	U	629	U	696	U
1,3-DICHLOROBENZENE	ug/Kg	567	U	536	U	629	U	696	U
1,4-DICHLOROBENZENE	ug/Kg	567	U	536	U	629	U	696	U
2,4,5-TRICHLOROPHENOL	ug/Kg	1700	U	1610	U	1890	U	2090	U
2,4,6-TRICHLOROPHENOL	ug/Kg	567	U	536	U	629	U	696	U
2,4-DICHLOROPHENOL	ug/Kg	567	U	536	U	629	U	696	U
2,4-DIMETHYLPHENOL	ug/Kg	567	U	536	U	629	U	696	U
2,4-DINITROPHENOL	ug/Kg	1700	U	1610	U	1890	U	2090	U
2,4-DINITROTOLUENE	ug/Kg	567	U	536	U	629	U	696	U
2,6-DINITROTOLUENE	ug/Kg	567	U	536	U	629	U	696	U
2-CHLORONAPHTHALENE	ug/Kg	567	U	536	U	629	U	696	U
2-CHLOROPHENOL	ug/Kg	567	U	536	U	629	U	696	U
2-METHYLNAPHTHALENE	ug/Kg	567	U	536	U	629	U	696	U
2-METHYLPHENOL (o-CRESOL)	ug/Kg	567	U	536	U	629	U	696	U
2-NITROANILINE	ug/Kg	1700	U	1610	U	1890	U	2090	U
2-NITROPHENOL	ug/Kg	567	U	536	U	629	U	696	U
3,3'-DICHLOROBENZIDINE	ug/Kg	1130	U	1070	U	1260	U	1390	U
3-NITROANILINE	ug/Kg	1700	U	1610	U	1890	U	2090	U
4,6-DINITRO-2-METHYLPHENOL	ug/Kg	1700	U	1610	U	1890	U	2090	U
4-BROMOPHENYL PHENYL ETHER	ug/Kg	567	U	536	U	629	U	696	U
4-CHLORO-3-METHYLPHENOL	ug/Kg	567	U	536	U	629	U	696	U
4-CHLOROANILINE	ug/Kg	567	U	536	U	629	U	696	U
4-CHLOROPHENYL PHENYL ETHER	ug/Kg	567	U	536	U	629	U	696	U
4-NITROANILINE	ug/Kg	1700	U	1610	U	1890	U	2090	U
4-NITROPHENOL	ug/Kg	1700	U	1610	U	1890	U	2090	U
ACENAPHTHENE	ug/Kg	567	U	536	U	629	U	696	U
ACENAPHTHYLENE	ug/Kg	567	U	536	U	629	U	696	U
ANTHRACENE	ug/Kg	567	U	536	U	629	U	696	U
BENZO(a)ANTHRACENE	ug/Kg	567	U	536	U	629	U	696	U
BENZO(a)PYRENE	ug/Kg	567	U	536	U	59	J	696	U
BENZO(b)FLUORANTHENE	ug/Kg	567	U	536	U	87	J	696	U
BENZO(g,h,i)PERYLENE	ug/Kg	567	U	536	U	54	J	696	U
BENZO(k)FLUORANTHENE	ug/Kg	567	U	536	U	52	J	696	U
BENZYL BUTYL PHTHALATE	ug/Kg	567	U	536	U	629	U	696	U
bis(2-CHLOROETHOXY) METHANE	ug/Kg	567	U	536	U	629	U	696	U
bis(2-CHLOROETHYL) ETHER (2-CHLOROETHYL ETHER)	ug/Kg	567	U	536	U	629	U	696	U

Analytical Data Summary

	StationID	W6-SB08	
	SampleID	NDA118	
	Date Collected	04/20/00	
	SampleType	N	
Parameter	Units		
1,2,4-TRICHLOROBENZENE	ug/Kg	548	U
1,2-DICHLOROBENZENE	ug/Kg	548	U
1,3-DICHLOROBENZENE	ug/Kg	548	U
1,4-DICHLOROBENZENE	ug/Kg	548	U
2,4,5-TRICHLOROPHENOL	ug/Kg	1640	U
2,4,6-TRICHLOROPHENOL	ug/Kg	548	U
2,4-DICHLOROPHENOL	ug/Kg	548	U
2,4-DIMETHYLPHENOL	ug/Kg	548	U
2,4-DINITROPHENOL	ug/Kg	1640	U
2,4-DINITROTOLUENE	ug/Kg	548	U
2,6-DINITROTOLUENE	ug/Kg	548	U
2-CHLORONAPHTHALENE	ug/Kg	548	U
2-CHLOROPHENOL	ug/Kg	548	U
2-METHYLNAPHTHALENE	ug/Kg	548	U
2-METHYLPHENOL (o-CRESOL)	ug/Kg	548	U
2-NITROANILINE	ug/Kg	1640	U
2-NITROPHENOL	ug/Kg	548	U
3,3'-DICHLOROBENZIDINE	ug/Kg	1100	U
3-NITROANILINE	ug/Kg	1640	U
4,6-DINITRO-2-METHYLPHENOL	ug/Kg	1640	U
4-BROMOPHENYL PHENYL ETHER	ug/Kg	548	U
4-CHLORO-3-METHYLPHENOL	ug/Kg	548	U
4-CHLOROANILINE	ug/Kg	548	U
4-CHLOROPHENYL PHENYL ETHER	ug/Kg	548	U
4-NITROANILINE	ug/Kg	1640	U
4-NITROPHENOL	ug/Kg	1640	U
ACENAPHTHENE	ug/Kg	548	U
ACENAPHTHYLENE	ug/Kg	548	U
ANTHRACENE	ug/Kg	548	U
BENZO(a)ANTHRACENE	ug/Kg	548	U
BENZO(a)PYRENE	ug/Kg	548	U
BENZO(b)FLUORANTHENE	ug/Kg	548	U
BENZO(g,h,i)PERYLENE	ug/Kg	548	U
BENZO(k)FLUORANTHENE	ug/Kg	548	U
BENZYL BUTYL PHTHALATE	ug/Kg	548	U
bis(2-CHLOROETHOXY) METHANE	ug/Kg	548	U
bis(2-CHLOROETHYL) ETHER (2-CHLOROETHYL ETHER)	ug/Kg	548	U

Analytical Data Summary

Parameter	Units	StationID		W6-SB01		W6-SB02		W6-SB02		W6-SB03	
		SampleID		NDA102		NDA105		NDA106FD1		NDA108	
		Date Collected		04/24/00		04/24/00		04/24/00		04/24/00	
		SampleType		N		N		FD		N	
bis(2-CHLOROISOPROPYL) ETHER	ug/Kg		684	U	748	U	737	U	637	U	
bis(2-ETHYLHEXYL) PHTHALATE	ug/Kg		684	U	748	U	737	U	135	J	
CARBAZOLE	ug/Kg		684	U	748	U	737	U	637	U	
CHRYSENE	ug/Kg		122	J	748	U	737	U	637	U	
CRESOLS, m & p	ug/Kg		684	U	748	U	737	U	637	U	
DI-n-BUTYL PHTHALATE	ug/Kg		684	U	748	U	737	U	637	U	
DI-n-OCTYLPHTHALATE	ug/Kg		684	U	748	U	737	U	637	U	
DIBENZ(a,h)ANTHRACENE	ug/Kg		684	U	748	U	737	U	637	U	
DIBENZOFURAN	ug/Kg		684	U	748	U	737	U	637	U	
DIETHYL PHTHALATE	ug/Kg		684	U	748	U	737	U	637	U	
DIMETHYL PHTHALATE	ug/Kg		684	U	748	U	737	U	637	U	
FLUORANTHENE	ug/Kg		125	J	748	U	737	U	637	U	
FLUORENE	ug/Kg		684	U	748	U	737	U	637	U	
HEXACHLOROBENZENE	ug/Kg		684	U	748	U	737	U	637	U	
HEXACHLOROBUTADIENE	ug/Kg		684	U	748	U	737	U	637	U	
HEXACHLOROCYCLOPENTADIENE	ug/Kg		684	U	748	U	737	U	637	U	
HEXACHLOROETHANE	ug/Kg		684	U	748	U	737	U	637	U	
INDENO(1,2,3-c,d)PYRENE	ug/Kg		70	J	748	U	737	U	637	U	
ISOPHORONE	ug/Kg		684	U	748	U	737	U	637	U	
N-NITROSODI-n-PROPYLAMINE	ug/Kg		684	U	748	U	737	U	637	U	
N-NITROSODIPHENYLAMINE	ug/Kg		684	U	748	U	737	U	637	U	
NAPHTHALENE	ug/Kg		684	U	748	U	737	U	637	U	
NITROBENZENE	ug/Kg		684	U	748	U	737	U	637	U	
PENTACHLOROPHENOL	ug/Kg		2050	U	2240	U	2210	U	1910	U	
PHENANTHRENE	ug/Kg		85	J	748	U	737	U	637	U	
PHENOL	ug/Kg		684	U	748	U	737	U	637	U	
PYRENE	ug/Kg		195	J	748	U	737	U	637	U	

Analytical Data Summary

	StationID	W6-SB04		W6-SB05		W6-SB06		W6-SB07	
	SampleID	NDA110		NDA112		NDA114		NDA116	
	Date Collected	04/24/00		04/24/00		04/20/00		04/20/00	
	SampleType	N		N		N		N	
Parameter	Units								
bis(2-CHLOROISOPROPYL) ETHER	ug/Kg	567	U	536	U	629	U	696	U
bis(2-ETHYLHEXYL) PHTHALATE	ug/Kg	567	U	536	U	629	U	696	U
CARBAZOLE	ug/Kg	567	U	536	U	629	U	696	U
CHRYSENE	ug/Kg	567	U	536	U	45	J	696	U
CRESOLS, m & p	ug/Kg	567	U	536	U	629	U	696	U
DI-n-BUTYL PHTHALATE	ug/Kg	567	U	536	U	629	U	696	U
DI-n-OCTYLPHTHALATE	ug/Kg	567	U	536	U	629	U	696	U
DIBENZ(a,h)ANTHRACENE	ug/Kg	567	U	536	U	629	U	696	U
DIBENZOFURAN	ug/Kg	567	U	536	U	629	U	696	U
DIETHYL PHTHALATE	ug/Kg	567	U	536	U	629	U	696	U
DIMETHYL PHTHALATE	ug/Kg	567	U	536	U	629	U	696	U
FLUORANTHENE	ug/Kg	567	U	43	J	629	U	696	U
FLUORENE	ug/Kg	567	U	536	U	629	U	696	U
HEXACHLOROBENZENE	ug/Kg	567	U	536	U	629	U	696	U
HEXACHLOROBUTADIENE	ug/Kg	567	U	536	U	629	U	696	U
HEXACHLOROCYCLOPENTADIENE	ug/Kg	567	U	536	U	629	U	696	U
HEXACHLOROETHANE	ug/Kg	567	U	536	U	629	U	696	U
INDENO(1,2,3-c,d)PYRENE	ug/Kg	567	U	536	U	62	J	696	U
ISOPHORONE	ug/Kg	567	U	536	U	629	U	696	U
N-NITROSODI-n-PROPYLAMINE	ug/Kg	567	U	536	U	629	U	696	U
N-NITROSODIPHENYLAMINE	ug/Kg	567	U	536	U	629	U	696	U
NAPHTHALENE	ug/Kg	567	U	536	U	629	U	696	U
NITROBENZENE	ug/Kg	567	U	536	U	629	U	696	U
PENTACHLOROPHENOL	ug/Kg	1700	U	1610	U	1890	U	2090	U
PHENANTHRENE	ug/Kg	567	U	536	U	629	U	696	U
PHENOL	ug/Kg	567	U	536	U	629	U	696	U
PYRENE	ug/Kg	567	U	31	J	629	U	696	U

Analytical Data Summary

	StationID	W6-SB08	
	SampleID	NDA118	
	Date Collected	04/20/00	
	SampleType	N	
Parameter	Units		
bis(2-CHLOROISOPROPYL) ETHER	ug/Kg	548	U
bis(2-ETHYLHEXYL) PHTHALATE	ug/Kg	548	U
CARBAZOLE	ug/Kg	548	U
CHRYSENE	ug/Kg	548	U
CRESOLS, m & p	ug/Kg	548	U
DI-n-BUTYL PHTHALATE	ug/Kg	548	U
DI-n-OCTYLPHTHALATE	ug/Kg	548	U
DIBENZ(a,h)ANTHRACENE	ug/Kg	548	U
DIBENZOFURAN	ug/Kg	548	U
DIETHYL PHTHALATE	ug/Kg	548	U
DIMETHYL PHTHALATE	ug/Kg	548	U
FLUORANTHENE	ug/Kg	548	U
FLUORENE	ug/Kg	548	U
HEXACHLOROBENZENE	ug/Kg	548	U
HEXACHLOROBUTADIENE	ug/Kg	548	U
HEXACHLOROCYCLOPENTADIENE	ug/Kg	548	U
HEXACHLOROETHANE	ug/Kg	548	U
INDENO(1,2,3-c,d)PYRENE	ug/Kg	548	U
ISOPHORONE	ug/Kg	548	U
N-NITROSODI-n-PROPYLAMINE	ug/Kg	548	U
N-NITROSODIPHENYLAMINE	ug/Kg	548	U
NAPHTHALENE	ug/Kg	548	U
NITROBENZENE	ug/Kg	548	U
PENTACHLOROPHENOL	ug/Kg	1640	U
PHENANTHRENE	ug/Kg	548	U
PHENOL	ug/Kg	548	U
PYRENE	ug/Kg	548	U

Analytical Data Summary

	StationID	W6-SB01		W6-SB02		W6-SB02		W6-SB03	
	SampleID	NDA102		NDA105		NDA106FD1		NDA108	
	Date Collected	04/24/00		04/24/00		04/24/00		04/24/00	
	SampleType	N		N		FD		N	
Parameter	Units								
ACETONE	ug/Kg	25	R	22	R	21	R	18	R
BROMODICHLOROMETHANE	ug/Kg	14	U	17	U	16	U	13	U
BROMOMETHANE	ug/Kg	14	U	17	U	16	U	13	U
BENZENE	ug/Kg	14	U	0.2	J	16	U	13	U
TOLUENE	ug/Kg	14	U	0.9	J	16	U	13	U
CARBON DISULFIDE	ug/Kg	2	J	4	J	2	J	2	J
CHLOROBENZENE	ug/Kg	14	U	17	U	16	U	13	U
CHLOROETHANE	ug/Kg	14	U	17	U	16	U	13	U
CHLOROMETHANE	ug/Kg	14	U	17	U	16	U	13	U
CARBON TETRACHLORIDE	ug/Kg	14	U	17	U	16	U	13	U
DIBROMOCHLOROMETHANE	ug/Kg	14	U	17	U	16	U	13	U
1,1-DICHLOROETHANE	ug/Kg	14	U	17	U	16	U	13	U
1,2-DICHLOROETHANE	ug/Kg	14	U	17	U	16	U	13	U
1,1-DICHLOROETHENE	ug/Kg	14	U	17	U	16	U	13	U
cis-1,3-DICHLOROPROPENE	ug/Kg	14	U	17	U	16	U	13	U
trans-1,3-DICHLOROPROPENE	ug/Kg	14	U	17	U	16	U	13	U
1,2-DICHLOROPROPANE	ug/Kg	14	U	17	U	16	U	13	U
ETHYLBENZENE	ug/Kg	14	U	1	J	16	U	13	U
2-HEXANONE	ug/Kg	14	U	17	U	16	U	13	U
METHYL ETHYL KETONE (2-BUTANONE)	ug/Kg	3	J	17	R	16	R	13	R
METHYL ISOBUTYL KETONE (4-METHYL-2-PENTANONE)	ug/Kg	14	U	17	U	16	U	13	U
METHYLENE CHLORIDE	ug/Kg	14	U	17	U	16	U	13	U
1,1,2,2-TETRACHLOROETHANE	ug/Kg	14	U	17	U	16	U	13	U
TETRACHLOROETHYLENE(PCE)	ug/Kg	14	U	2	J	16	U	13	U
STYRENE	ug/Kg	14	U	17	U	16	U	13	U
BROMOFORM	ug/Kg	14	U	17	U	16	U	13	U
1,1,1-TRICHLOROETHANE	ug/Kg	14	U	17	U	16	U	13	U
1,1,2-TRICHLOROETHANE	ug/Kg	14	U	17	U	16	U	13	U
TRICHLOROETHYLENE (TCE)	ug/Kg	14	U	17	U	16	U	13	U
CHLOROFORM	ug/Kg	14	U	17	U	16	U	13	U
VINYL CHLORIDE	ug/Kg	14	U	17	U	16	U	13	U
XYLENES, TOTAL	ug/Kg	0.6	J	17	U	16	U	13	U
M,P-XYLENE (SUM OF ISOMERS)	ug/Kg	0.6	J	17	U	16	U	13	U
O-XYLENE (1,2-DIMETHYLBENZENE)	ug/Kg	14	U	2	J	16	U	13	U

Analytical Data Summary

	StationID	W6-SB04		W6-SB05		W6-SB06		W6-SB07	
	SampleID	NDA110		NDA112		NDA114		NDA116	
	Date Collected	04/24/00		04/24/00		04/20/00		04/20/00	
	SampleType	N		N		N		N	
Parameter	Units								
ACETONE	ug/Kg	11	R	12	R	13	R	26	R
BROMODICHLOROMETHANE	ug/Kg	11	U	11	U	11	U	11	U
BROMOMETHANE	ug/Kg	11	U	11	U	11	U	11	U
BENZENE	ug/Kg	11	U	0.2	J	11	U	11	U
TOLUENE	ug/Kg	11	U	11	U	11	U	11	U
CARBON DISULFIDE	ug/Kg	11	U	1	J	11	U	6	J
CHLOROBENZENE	ug/Kg	11	U	11	U	11	U	11	U
CHLOROETHANE	ug/Kg	11	U	11	U	11	U	11	U
CHLOROMETHANE	ug/Kg	11	U	11	U	11	U	11	U
CARBON TETRACHLORIDE	ug/Kg	11	U	11	U	11	U	11	U
DIBROMOCHLOROMETHANE	ug/Kg	11	U	11	U	11	U	11	U
1,1-DICHLOROETHANE	ug/Kg	11	U	11	U	11	U	11	U
1,2-DICHLOROETHANE	ug/Kg	11	U	11	U	11	U	11	U
1,1-DICHLOROETHENE	ug/Kg	11	U	11	U	11	U	11	U
cis-1,3-DICHLOROPROPENE	ug/Kg	11	U	11	U	11	U	11	U
trans-1,3-DICHLOROPROPENE	ug/Kg	11	U	11	U	11	U	11	U
1,2-DICHLOROPROPANE	ug/Kg	11	U	11	U	11	U	11	U
ETHYLBENZENE	ug/Kg	11	U	11	U	11	U	11	U
2-HEXANONE	ug/Kg	11	U	11	U	11	U	11	U
METHYL ETHYL KETONE (2-BUTANONE)	ug/Kg	11	R	11	R	11	R	11	R
METHYL ISOBUTYL KETONE (4-METHYL-2-PENTANONE)	ug/Kg	11	U	11	U	11	U	11	U
METHYLENE CHLORIDE	ug/Kg	11	U	11	U	11	U	11	U
1,1,2,2-TETRACHLOROETHANE	ug/Kg	11	U	11	U	11	U	11	U
TETRACHLOROETHYLENE(PCE)	ug/Kg	11	U	11	U	11	U	11	U
STYRENE	ug/Kg	11	U	11	U	11	U	11	U
BROMOFORM	ug/Kg	11	U	11	U	11	U	11	U
1,1,1-TRICHLOROETHANE	ug/Kg	11	U	11	U	11	U	11	U
1,1,2-TRICHLOROETHANE	ug/Kg	11	U	11	U	11	U	11	U
TRICHLOROETHYLENE (TCE)	ug/Kg	11	U	11	U	11	U	11	U
CHLOROFORM	ug/Kg	11	U	11	U	11	U	11	U
VINYL CHLORIDE	ug/Kg	11	U	11	U	11	U	11	U
XYLENES, TOTAL	ug/Kg	11	U	11	U	11	U	11	U
M,P-XYLENE (SUM OF ISOMERS)	ug/Kg	11	U	11	U	11	U	11	U
O-XYLENE (1,2-DIMETHYLBENZENE)	ug/Kg	11	U	11	U	11	U	11	U

Analytical Data Summary

	StationID	W6-SB08	
	SampleID	NDA118	
	Date Collected	04/20/00	
	SampleType	N	
Parameter	Units		
ACETONE	ug/Kg	67	R
BROMODICHLOROMETHANE	ug/Kg	12	UJ
BROMOMETHANE	ug/Kg	12	UJ
BENZENE	ug/Kg	12	UJ
TOLUENE	ug/Kg	12	UJ
CARBON DISULFIDE	ug/Kg	6	J
CHLOROBENZENE	ug/Kg	12	UJ
CHLOROETHANE	ug/Kg	12	UJ
CHLOROMETHANE	ug/Kg	12	UJ
CARBON TETRACHLORIDE	ug/Kg	12	UJ
DIBROMOCHLOROMETHANE	ug/Kg	12	UJ
1,1-DICHLOROETHANE	ug/Kg	12	UJ
1,2-DICHLOROETHANE	ug/Kg	12	UJ
1,1-DICHLOROETHENE	ug/Kg	12	UJ
cis-1,3-DICHLOROPROPENE	ug/Kg	12	UJ
trans-1,3-DICHLOROPROPENE	ug/Kg	12	UJ
1,2-DICHLOROPROPANE	ug/Kg	12	UJ
ETHYLBENZENE	ug/Kg	12	UJ
2-HEXANONE	ug/Kg	12	UJ
METHYL ETHYL KETONE (2-BUTANONE)	ug/Kg	12	R
METHYL ISOBUTYL KETONE (4-METHYL-2-PENTANONE)	ug/Kg	12	UJ
METHYLENE CHLORIDE	ug/Kg	12	UJ
1,1,2,2-TETRACHLOROETHANE	ug/Kg	12	UJ
TETRACHLOROETHYLENE(PCE)	ug/Kg	12	UJ
STYRENE	ug/Kg	12	UJ
BROMOFORM	ug/Kg	12	UJ
1,1,1-TRICHLOROETHANE	ug/Kg	12	UJ
1,1,2-TRICHLOROETHANE	ug/Kg	12	UJ
TRICHLOROETHYLENE (TCE)	ug/Kg	12	UJ
CHLOROFORM	ug/Kg	12	UJ
VINYL CHLORIDE	ug/Kg	12	UJ
XYLENES, TOTAL	ug/Kg	12	UJ
M,P-XYLENE (SUM OF ISOMERS)	ug/Kg	12	UJ
O-XYLENE (1,2-DIMETHYLBENZENE)	ug/Kg	12	UJ

Groundwater

Analytical Data Summary

	StationID	NDW06MW01		NDW06MW02		NDW06MW03		NDW06MW04	
	SampleID	NDW06GW01-R01		NDW06GW02-R01		NDW06GW03-R01		NDW06GW04-R01	
	Date Collected	09/05/03		09/05/03		09/05/03		09/07/03	
	SampleType	N		N		N		N	
Parameter	Units								
Alkalinity, bicarbonate (as caco3)	mg/L	860	=	1150	=	800	=	1030	=
Alkalinity, carbonate (as caco3)	mg/L	0.5	U	0.5	U	0.5	U	0.5	U
Alkalinity, hydroxide (as caco3)	mg/L	0.5	U	0.5	U	0.5	U	0.5	U

Analytical Data Summary

	StationID	NDW06MW05		NDW06MW05		NDW06MW06		NDW06MW07	
	SampleID	NDW06FD01P-R01		NDW06GW05-R01		NDW06GW06-R01		NDW06GW07-R01	
	Date Collected	09/05/03		09/05/03		09/05/03		09/07/03	
	SampleType	FD		N		N		N	
Parameter	Units								
Alkalinity, bicarbonate (as caco3)	mg/L	830	=	810	=	770	=	840	=
Alkalinity, carbonate (as caco3)	mg/L	0.5	U	0.5	U	0.5	U	0.5	U
Alkalinity, hydroxide (as caco3)	mg/L	0.5	U	0.5	U	0.5	U	0.5	U

Analytical Data Summary

	StationID	NDW06MW08	
	SampleID	NDW06GW08-R01	
	Date Collected	09/07/03	
	SampleType	N	
Parameter	Units		
Alkalinity, bicarbonate (as caco3)	mg/L	775	=
Alkalinity, carbonate (as caco3)	mg/L	0.5	U
Alkalinity, hydroxide (as caco3)	mg/L	0.5	U

Analytical Data Summary

	StationID	NDW06MW01		NDW06MW02		NDW06MW03		NDW06MW05	
	SampleID	NDW06GW01-R01		NDW06GW02-R01		NDW06GW03-R01		NDW06FD01P-R01	
	Date Collected	09/05/03		09/05/03		09/05/03		09/05/03	
	SampleType	N		N		N		FD	
Parameter	Units								
Chloride (as Cl)	mg/L	40500	=	36500	=	31000	=	27800	=
Nitrogen, nitrate (as n)	mg/L	0.0201	U	0.0561	J	0.0201	U	0.0201	U
Nitrogen, nitrite	mg/L	0.056	J	0.0493	J	0.0477	J	0.0545	J
Phosphorus, total orthophosphate (as p)	mg/L	0.421	J	0.064	J	0.033	J	0.239	J
Sulfate (as SO4)	mg/L	4390	=	1790	=	3590	=	3440	=

Analytical Data Summary

	StationID	NDW06MW05		NDW06MW06		NDW06MW04		NDW06MW07	
	SampleID	NDW06GW05-R01		NDW06GW06-R01		NDW06GW04-R01		NDW06GW07-R01	
	Date Collected	09/05/03		09/05/03		09/07/03		09/07/03	
	SampleType	N		N		N		N	
Parameter	Units								
Chloride (as Cl)	mg/L	28700	=	33300	=	33200	=	34300	=
Nitrogen, nitrate (as n)	mg/L	0.0201	U	0.0229	J	0.196	J	0.131	J
Nitrogen, nitrite	mg/L	0.0422	J	0.0419	J	0.0431	J	0.0479	J
Phosphorus, total orthophosphate (as p)	mg/L	0.316	J	0.353	J	0.445	J	0.38	J
Sulfate (as SO4)	mg/L	3020	=	3820	=	3630	=	4450	=

Analytical Data Summary

	StationID	NDW06MW08	
	SampleID	NDW06GW08-R01	
	Date Collected	09/07/03	
	SampleType	N	
Parameter	Units		
Chloride (as Cl)	mg/L	28400	=
Nitrogen, nitrate (as n)	mg/L	0.0201	UJ
Nitrogen, nitrite	mg/L	0.0384	J
Phosphorus, total orthophosphate (as p)	mg/L	0.475	J
Sulfate (as SO4)	mg/L	3310	=

Analytical Data Summary

	StationID	SWMU6-MW01		SWMU6-MW02		SWMU6-MW03		SWMU6-MW04	
	SampleID	NDA006		NDA008		NDA009		NDA005	
	Date Collected	05/02/00		05/02/00		05/02/00		05/02/00	
	SampleType	N		N		N		N	
Parameter	Units								
Aluminum, dissolved	ug/L	25.8	U	25.8	U	25.8	U	25.8	U
Antimony, dissolved	ug/L	1.4	U	1.4	U	1.8	J	1.4	U
Arsenic, dissolved	ug/L	7.3	J	4.8	J	5.9	J	13.3	=
Barium, dissolved	ug/L	481	=	294	=	179	J	381	=
Beryllium, dissolved	ug/L	0.3	U	0.3	U	0.3	U	0.3	U
Cadmium, dissolved	ug/L	2.9	J	1.8	J	2	J	2	J
Calcium, dissolved	ug/L	644000	=	777000	=	846000	=	732000	=
Chromium, dissolved	ug/L	4.7	J	0.5	U	0.5	U	4.5	J
Cobalt, dissolved	ug/L	0.55	J	0.5	U	0.5	U	0.92	J
Copper, dissolved	ug/L	1.9	U	1.9	U	1.9	U	1.9	U
Iron, dissolved	ug/L	12.2	R	12.7	J	12.2	R	12.2	R
Lead, dissolved	ug/L	3	J	2.7	J	3.8	=	2.6	J
Magnesium, dissolved	ug/L	2090000	=	2180000	=	2330000	=	1950000	=
Manganese, dissolved	ug/L	11800	=	2070	=	1170	=	10600	=
Mercury, dissolved	ug/L	0.18	U	0.18	U	0.18	U	0.18	U
Nickel, dissolved	ug/L	1.6	J	2.1	J	1	J	4	J
Potassium, dissolved	ug/L	26.6	U	26.6	U	26.6	U	26.6	U
Selenium, dissolved	ug/L	5.7	=	5	J	2.1	U	6.4	=
Silver, dissolved	ug/L	0.93	J	0.5	U	0.5	U	2.1	J
Sodium, dissolved	ug/L	15100000	=	16800000	=	16400000	=	15000000	=
Thallium, dissolved	ug/L	2.7	U	2.7	U	2.7	U	2.7	U
Vanadium, dissolved	ug/L	2.7	J	4.5	J	4.8	J	8.1	J
Zinc, dissolved	ug/L	12.5	U	12.5	U	12.5	U	12.5	U

Analytical Data Summary

	StationID	NDW06MW01		NDW06MW02		NDW06MW03		NDW06MW05	
	SampleID	NDW06GW01-R01		NDW06GW02-R01		NDW06GW03-R01		NDW06FD01P-R01	
	Date Collected	09/05/03		09/05/03		09/05/03		09/05/03	
	SampleType	N		N		N		FD	
Parameter	Units								
Aluminum, dissolved	ug/L	350	U	350	U	350	U	350	U
Antimony, dissolved	ug/L	25	U	25	U	25	U	25	U
Arsenic, dissolved	ug/L	23.6	J	25.2	J	21.7	J	41.6	J
Barium, dissolved	ug/L	164	J	780	J	135	J	153	J
Beryllium, dissolved	ug/L	0.945	U	0.945	U	0.945	U	0.945	U
Cadmium, dissolved	ug/L	3.56	U	3.56	U	3.56	U	3.56	U
Calcium, dissolved	ug/L	997000	=	332000	=	693000	=	739000	=
Chromium, dissolved	ug/L	5.7	U	12.4	J	8.91	J	16.2	J
Cobalt, dissolved	ug/L	5.69	U	7.27	J	7.55	J	12.5	J
Copper, dissolved	ug/L	11.7	U	11.7	U	11.7	U	11.7	U
Iron, dissolved	ug/L	167	U	2320	J	5230	J	532	J
Lead, dissolved	ug/L	218	J	210	J	176	U	176	U
Magnesium, dissolved	ug/L	2770000	=	2190000	=	2230000	=	2020000	=
Manganese, dissolved	ug/L	499	=	432	=	1070	=	1070	=
Mercury, dissolved	ug/L	0.054	J	0.0475	J	0.0162	U	0.0162	U
Nickel, dissolved	ug/L	9.97	U	9.97	U	9.97	U	9.97	U
Potassium, dissolved	ug/L	1080000	J	1080000	J	1010000	J	851000	J
Selenium, dissolved	ug/L	210	U	210	U	258	J	210	U
Silver, dissolved	ug/L	4.72	U	4.72	U	4.72	U	4.72	U
Sodium, dissolved	ug/L	18900000	=	17000000	=	15800000	=	13900000	=
Thallium, dissolved	ug/L	254	U	254	U	254	U	254	U
Vanadium, dissolved	ug/L	4.47	U	4.47	U	4.47	U	4.47	U
Zinc, dissolved	ug/L	4.09	U	4.09	U	4.09	U	4.09	U

Analytical Data Summary

	StationID	NDW06MW05		NDW06MW06		NDW06MW04		NDW06MW07	
	SampleID	NDW06GW05-R01		NDW06GW06-R01		NDW06GW04-R01		NDW06GW07-R01	
	Date Collected	09/05/03		09/05/03		09/07/03		09/07/03	
	SampleType	N		N		N		N	
Parameter	Units								
Aluminum, dissolved	ug/L	350	U	350	U	875	UJ	875	UJ
Antimony, dissolved	ug/L	25	U	25	U	62.5	U	62.5	U
Arsenic, dissolved	ug/L	20.4	U	30.3	J	51	UJ	51	UJ
Barium, dissolved	ug/L	156	J	157	J	145	J	144	J
Beryllium, dissolved	ug/L	0.945	U	0.945	U	5.53	J	3.5	J
Cadmium, dissolved	ug/L	3.56	U	3.56	U	8.9	U	8.9	U
Calcium, dissolved	ug/L	724000	=	938000	=	698000	=	1150000	=
Chromium, dissolved	ug/L	5.7	U	9.19	J	19.8	J	16.1	J
Cobalt, dissolved	ug/L	6.85	J	5.69	U	25.5	J	21.5	J
Copper, dissolved	ug/L	11.7	U	11.7	U	29.2	UJ	29.2	UJ
Iron, dissolved	ug/L	338	J	167	U	418	U	418	U
Lead, dissolved	ug/L	260	J	176	U	44	UJ	44	UJ
Magnesium, dissolved	ug/L	1970000	=	2580000	=	1900000	=	2640000	=
Manganese, dissolved	ug/L	1070	=	766	=	315	J	483	=
Mercury, dissolved	ug/L	0.0251	J	0.0336	J	0.0241	J	0.0464	J
Nickel, dissolved	ug/L	9.97	U	9.97	U	24.9	U	24.9	U
Potassium, dissolved	ug/L	869000	J	918000	J	743000	J	686000	J
Selenium, dissolved	ug/L	253	J	210	U	110	J	98.6	J
Silver, dissolved	ug/L	4.72	U	4.72	U	11.8	U	11.8	U
Sodium, dissolved	ug/L	13400000	=	14900000	=	13700000	=	15800000	=
Thallium, dissolved	ug/L	254	U	254	U	63.5	U	63.5	U
Vanadium, dissolved	ug/L	4.47	U	4.47	U	11.2	U	11.2	U
Zinc, dissolved	ug/L	4.09	U	4.09	U	10.2	U	10.2	U

Analytical Data Summary

	StationID	NDW06MW08	
	SampleID	NDW06GW08-R01	
	Date Collected	09/07/03	
	SampleType	N	
Parameter	Units		
Aluminum, dissolved	ug/L	700	UJ
Antimony, dissolved	ug/L	50	U
Arsenic, dissolved	ug/L	40.8	UJ
Barium, dissolved	ug/L	124	J
Beryllium, dissolved	ug/L	3.81	J
Cadmium, dissolved	ug/L	7.12	U
Calcium, dissolved	ug/L	1060000	=
Chromium, dissolved	ug/L	16.2	J
Cobalt, dissolved	ug/L	16.3	J
Copper, dissolved	ug/L	23.4	UJ
Iron, dissolved	ug/L	334	U
Lead, dissolved	ug/L	35.2	UJ
Magnesium, dissolved	ug/L	2140000	=
Manganese, dissolved	ug/L	593	=
Mercury, dissolved	ug/L	0.0162	UJ
Nickel, dissolved	ug/L	19.9	U
Potassium, dissolved	ug/L	620000	J
Selenium, dissolved	ug/L	53	J
Silver, dissolved	ug/L	9.44	U
Sodium, dissolved	ug/L	13100000	=
Thallium, dissolved	ug/L	50.8	U
Vanadium, dissolved	ug/L	8.94	U
Zinc, dissolved	ug/L	8.18	U

Analytical Data Summary

	StationID	SWMU6-MW01		SWMU6-MW02		SWMU6-MW03		SWMU6-MW04	
	SampleID	NDA006		NDA008		NDA009		NDA005	
	Date Collected	05/02/00		05/02/00		05/02/00		05/02/00	
	SampleType	N		N		N		N	
Parameter	**Units**								
Aluminum	ug/L	306	=	1460	=	182	J	164	J
Antimony	ug/L	1.4	U	3.7	J	1.4	U	1.4	U
Arsenic	ug/L	6.8	J	3.5	J	6.5	J	10	=
Barium	ug/L	519	=	283	=	194	J	425	=
Beryllium	ug/L	0.32	J	0.44	J	0.42	J	0.33	J
Cadmium	ug/L	3.3	J	2	J	2.8	J	2.8	J
Calcium	ug/L	942000	=	625000	=	753000	=	735000	=
Chromium, Total	ug/L	5.7	J	4.2	J	2.7	J	8.9	J
Cobalt	ug/L	4	J	0.5	U	0.5	U	1.7	J
Copper	ug/L	1.9	U	10	J	1.9	U	1.9	U
Iron	ug/L	324	J	2500	J	43	J	55.5	J
Lead	ug/L	3.5	=	25.2	=	1.8	J	4.3	=
Magnesium	ug/L	2210000	=	2020000	=	2140000	=	1960000	=
Manganese	ug/L	14300	=	2070	=	1380	=	13800	=
Mercury	ug/L	0.18	U	0.18	U	0.18	U	0.18	U
Nickel	ug/L	2.7	J	3.7	J	1.5	J	4.4	J
Potassium	ug/L	26.6	U	26.6	U	26.6	U	26.6	U
Selenium	ug/L	7.2	=	2.9	J	5.9	=	7.1	=
Silver	ug/L	0.5	U	0.5	U	0.5	U	0.5	U
Sodium	ug/L	15600000	=	16600000	=	15400000	=	15500000	=
Thallium	ug/L	2.7	U	2.7	U	2.7	U	2.7	U
Vanadium	ug/L	3.7	J	9.9	J	6	J	7.5	J
Zinc	ug/L	12.5	U	12.5	U	12.5	U	177	=

Analytical Data Summary

	StationID	NDW06MW01		NDW06MW02		NDW06MW03		NDW06MW05	
	SampleID	NDW06GW01-R01		NDW06GW02-R01		NDW06GW03-R01		NDW06FD01P-R01	
	Date Collected	09/05/03		09/05/03		09/05/03		09/05/03	
	SampleType	N		N		N		FD	
Parameter	Units								
Aluminum	ug/L	350	U	350	U	350	U	350	U
Antimony	ug/L	25	U	51.8	J	104	J	25	U
Arsenic	ug/L	30.4	J	51.7	J	20.4	U	73.7	J
Barium	ug/L	158	J	728	J	122	J	134	J
Beryllium	ug/L	0.945	U	0.945	U	0.945	U	0.945	U
Cadmium	ug/L	3.56	U	3.56	U	3.56	U	5.28	J
Calcium	ug/L	1070000	=	355000	=	682000	=	734000	=
Chromium, Total	ug/L	13.7	J	5.7	U	5.7	U	32.7	J
Cobalt	ug/L	12.3	J	5.69	U	5.69	U	30.5	J
Copper	ug/L	18.7	J	11.7	U	11.7	U	35.1	J
Iron	ug/L	167	U	2040	J	6090	J	167	U
Lead	ug/L	62.2	=	97	=	41	=	148	J
Magnesium	ug/L	2990000	=	2360000	=	2220000	=	2050000	=
Manganese	ug/L	529	=	442	=	1090	=	1060	=
Mercury	ug/L	0.0162	U	0.0162	U	0.0162	U	0.0231	J
Nickel	ug/L	9.97	U	9.97	U	9.97	U	9.97	U
Potassium	ug/L	1050000	=	1040000	=	965000	=	888000	=
Selenium	ug/L	93.1	=	133	=	103	=	253	J
Silver	ug/L	6.71	J	12.6	J	4.72	U	4.72	U
Sodium	ug/L	19200000	J	16100000	J	14600000	J	13500000	J
Thallium	ug/L	25.4	U	25.4	U	25.4	U	39.5	J
Vanadium	ug/L	4.47	U	4.47	U	4.47	U	4.47	U
Zinc	ug/L	4.09	U	4.09	U	4.09	U	4.09	U

Analytical Data Summary

	StationID	NDW06MW05		NDW06MW06		NDW06MW04		NDW06MW07	
	SampleID	NDW06GW05-R01		NDW06GW06-R01		NDW06GW04-R01		NDW06GW07-R01	
	Date Collected	09/05/03		09/05/03		09/07/03		09/07/03	
	SampleType	N		N		N		N	
Parameter	Units								
Aluminum	ug/L	350	U	350	U	700	UJ	875	UJ
Antimony	ug/L	73.3	J	35.5	J	50	U	62.5	U
Arsenic	ug/L	152	J	120	=	40.8	UJ	51	UJ
Barium	ug/L	155	J	147	J	166	J	147	J
Beryllium	ug/L	0.945	U	0.945	U	1.89	U	3.92	J
Cadmium	ug/L	14.2	J	6.77	J	7.12	U	8.9	U
Calcium	ug/L	758000	=	954000	=	711000	=	1120000	=
Chromium, Total	ug/L	58.8	J	37.4	J	11.4	U	19.3	J
Cobalt	ug/L	59.9	J	36.6	J	11.4	U	27.2	J
Copper	ug/L	33.6	J	11.7	U	23.4	U	29.2	U
Iron	ug/L	584	J	167	U	334	U	418	U
Lead	ug/L	71	J	134	=	35.2	UJ	44	UJ
Magnesium	ug/L	2120000	=	2710000	=	1910000	=	2550000	=
Manganese	ug/L	1100	=	843	=	339	=	476	=
Mercury	ug/L	0.0162	U	0.0213	J	0.0162	UJ	0.024	J
Nickel	ug/L	26.6	J	9.97	U	19.9	U	24.9	U
Potassium	ug/L	930000	=	1020000	=	854000	J	700000	J
Selenium	ug/L	127	J	191	=	42	U	76.7	J
Silver	ug/L	56.4	J	4.72	U	9.44	U	11.8	U
Sodium	ug/L	13500000	J	15400000	J	14900000	=	15800000	=
Thallium	ug/L	60.4	J	25.4	U	56.5	J	63.5	U
Vanadium	ug/L	15.4	J	4.47	U	8.94	U	11.2	U
Zinc	ug/L	4.09	U	4.09	U	8.18	U	10.2	U

Analytical Data Summary

	StationID	NDW06MW08	
	SampleID	NDW06GW08-R01	
	Date Collected	09/07/03	
	SampleType	N	
Parameter	Units		
Aluminum	ug/L	700	UJ
Antimony	ug/L	50	U
Arsenic	ug/L	40.8	UJ
Barium	ug/L	131	J
Beryllium	ug/L	1.89	U
Cadmium	ug/L	7.12	U
Calcium	ug/L	1090000	=
Chromium, Total	ug/L	16.8	J
Cobalt	ug/L	11.5	J
Copper	ug/L	23.4	U
Iron	ug/L	334	U
Lead	ug/L	35.2	UJ
Magnesium	ug/L	2180000	=
Manganese	ug/L	616	=
Mercury	ug/L	0.0288	J
Nickel	ug/L	19.9	U
Potassium	ug/L	647000	J
Selenium	ug/L	42	U
Silver	ug/L	9.44	U
Sodium	ug/L	13500000	=
Thallium	ug/L	50.8	U
Vanadium	ug/L	8.94	U
Zinc	ug/L	8.18	U

Analytical Data Summary

	StationID	SWMU6-MW01		SWMU6-MW02		SWMU6-MW03		SWMU6-MW04	
	SampleID	NDA006		NDA008		NDA009		NDA005	
	Date Collected	05/02/00		05/02/00		05/02/00		05/02/00	
	SampleType	N		N		N		N	
Parameter	Units								
1,3-Dinitrobenzene	ug/L	5	UJ	5	UJ	5	UJ	5	UJ
2,4-Dinitrotoluene	ug/L	5	UJ	5	UJ	5	UJ	5	UJ
2,6-Dinitrotoluene	ug/L	5	UJ	5	UJ	5	UJ	5	UJ
Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine	ug/L	5	UJ	5	UJ	5	UJ	5	UJ
2-Nitrotoluene	ug/L	5	UJ	5	UJ	5	UJ	5	UJ
3-Nitrotoluene	ug/L	5	UJ	5	UJ	5	UJ	5	UJ
4-Nitrotoluene	ug/L	5	UJ	5	UJ	5	UJ	5	UJ
Nitrobenzene	ug/L	5	UJ	5	UJ	5	UJ	5	UJ
Hexahydro-1,3,5-trinitro-1,3,5,7-tetrazocine	ug/L	5	UJ	5	UJ	5	UJ	5	UJ
Tetryl	ug/L	5	UJ	5	UJ	5	UJ	5	UJ
1,3,5-Trinitrobenzene	ug/L	5	UJ	5	UJ	5	UJ	5	UJ
2,4,6-trinitrotoluene	ug/L	5	UJ	5	UJ	5	UJ	5	UJ

Analytical Data Summary

	StationID	NDW06MW01		NDW06MW02		NDW06MW03		NDW06MW05	
	SampleID	NDW06GW01-R01		NDW06GW02-R01		NDW06GW03-R01		NDW06FD01P-R01	
	Date Collected	09/05/03		09/05/03		09/05/03		09/05/03	
	SampleType	N		N		N		FD	
Parameter	Units								
1,3-Dinitrobenzene	ug/L	2.5	UJ	2.5	UJ	2.5	UJ	2.5	U
2,4-Dinitrotoluene	ug/L	2.5	UJ	2.5	UJ	2.5	UJ	2.5	U
2,6-Dinitrotoluene	ug/L	2.5	UJ	2.5	UJ	2.5	UJ	2.5	U
Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine	ug/L	2.5	UJ	2.5	UJ	2.5	UJ	2.5	U
2-Nitrotoluene	ug/L	2.5	UJ	2.5	UJ	2.5	UJ	2.5	U
3-Nitrotoluene	ug/L	2.5	UJ	2.5	UJ	2.5	UJ	2.5	U
4-Nitrotoluene	ug/L	2.5	UJ	2.5	UJ	2.5	UJ	2.5	U
Nitrobenzene	ug/L	2.5	UJ	2.5	UJ	2.5	UJ	2.5	U
Hexahydro-1,3,5-trinitro-1,3,5,7-tetrazocine	ug/L	2.5	UJ	2.5	UJ	2.5	UJ	2.5	U
Tetryl	ug/L	2.5	UJ	2.5	UJ	2.5	UJ	2.5	U
1,3,5-Trinitrobenzene	ug/L	2.5	UJ	2.5	UJ	2.5	UJ	2.5	U
2,4,6-trinitrotoluene	ug/L	2.5	UJ	2.5	UJ	2.5	UJ	2.5	U

Analytical Data Summary

	StationID	NDW06MW05		NDW06MW06		NDW06MW04		NDW06MW07	
	SampleID	NDW06GW05-R01		NDW06GW06-R01		NDW06GW04-R01		NDW06GW07-R01	
	Date Collected	09/05/03		09/05/03		09/07/03		09/07/03	
	SampleType	N		N		N		N	
Parameter	Units								
1,3-Dinitrobenzene	ug/L	2.5	UJ	2.5	UJ	2.5	UJ	2.5	UJ
2,4-Dinitrotoluene	ug/L	2.5	UJ	2.5	UJ	2.5	UJ	2.5	UJ
2,6-Dinitrotoluene	ug/L	2.5	UJ	2.5	UJ	2.5	UJ	2.5	UJ
Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine	ug/L	2.5	UJ	2.5	UJ	2.5	UJ	2.5	UJ
2-Nitrotoluene	ug/L	2.5	UJ	2.5	UJ	2.5	UJ	2.5	UJ
3-Nitrotoluene	ug/L	2.5	UJ	2.5	UJ	2.5	UJ	2.5	UJ
4-Nitrotoluene	ug/L	2.5	UJ	2.5	UJ	2.5	UJ	2.5	UJ
Nitrobenzene	ug/L	2.5	UJ	2.5	UJ	2.5	UJ	2.5	UJ
Hexahydro-1,3,5-trinitro-1,3,5,7-tetrazocine	ug/L	2.5	UJ	2.5	UJ	2.5	UJ	2.5	UJ
Tetryl	ug/L	2.5	UJ	2.5	UJ	2.5	UJ	2.5	UJ
1,3,5-Trinitrobenzene	ug/L	2.5	UJ	2.5	UJ	2.5	UJ	2.5	UJ
2,4,6-trinitrotoluene	ug/L	2.5	UJ	2.5	UJ	2.5	UJ	2.5	UJ

Analytical Data Summary

	StationID	NDW06MW08	
	SampleID	NDW06GW08-R01	
	Date Collected	09/07/03	
	SampleType	N	
Parameter	Units		
1,3-Dinitrobenzene	ug/L	2.5	UJ
2,4-Dinitrotoluene	ug/L	2.5	UJ
2,6-Dinitrotoluene	ug/L	2.5	UJ
Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine	ug/L	2.5	UJ
2-Nitrotoluene	ug/L	2.5	UJ
3-Nitrotoluene	ug/L	2.5	UJ
4-Nitrotoluene	ug/L	2.5	UJ
Nitrobenzene	ug/L	2.5	UJ
Hexahydro-1,3,5-trinitro-1,3,5,7-tetrazocine	ug/L	2.5	UJ
Tetryl	ug/L	2.5	UJ
1,3,5-Trinitrobenzene	ug/L	2.5	UJ
2,4,6-trinitrotoluene	ug/L	2.5	UJ

Analytical Data Summary

	StationID	SWMU6-MW01		SWMU6-MW02		SWMU6-MW02		SWMU6-MW03		SWMU6-MW04		NDW06
	SampleID	NDA336		NDA337		NDA342FD1		NDA338		NDA339		NDW06G
	Date Collected	06/03/00		06/03/00		06/03/00		06/03/00		06/03/00		09/0
	SampleType	N		N		FD		N		N		N
Parameter	Units											
Perchlorate	ug/L	40	U	40	U	40	U	40	U	40	U	12.8

Analytical Data Summary

	StationID	6MW01		NDW06MW01		NDW06MW02		NDW06MW03		NDW06MW05		NDW06MW05	
	SampleID	W01-R01		NDW6MW1-04		NDW06GW02-R01		NDW06GW03-R01		NDW06FD01P-R01		NDW06GW05-R01	
	Date Collected	5/03		02/11/04		09/05/03		09/05/03		09/05/03		09/05/03	
	SampleType	N		N		N		N		FD		N	
Parameter	**Units**												
Perchlorate	ug/L	J	20	U	20	U	20	U	20	U	20	U

Analytical Data Summary

	StationID	NDW06MW06		NDW06MW04		NDW06MW07	
	SampleID	NDW06GW06-R01		NDW06GW04-R01		NDW06GW07-R01	
	Date Collected	09/05/03		09/07/03		09/07/03	
	SampleType	N		N		N	
Parameter	Units						
Perchlorate	ug/L	20	U	20	U	20	U

Analytical Data Summary

	StationID	SWMU6-MW01		SWMU6-MW02		SWMU6-MW03		SWMU6-MW04		SWMU6-MW04	
	SampleID	NDA006		NDA008		NDA009		NDA005		MU6MW04	
	Date Collected	05/02/00		05/02/00		05/02/00		05/02/00		07/09/02	
	SampleType	N		N		N		N		N	
Parameter	Units										
Aroclor-1016	ug/L	0.22	U	0.21	U	0.22	U	0.24	U	1.1	U
Aroclor-1221	ug/L	0.43	U	0.42	U	0.43	U	0.7	=	1.1	U
Aroclor-1232	ug/L	0.22	U	0.21	U	0.22	U	0.09	J	1.1	U
Aroclor-1242	ug/L	0.22	U	0.21	U	0.22	U	0.24	U	1.1	U
Aroclor-1248	ug/L	0.22	U	0.21	U	0.22	U	0.24	U	1.1	U
Aroclor-1254	ug/L	0.22	U	0.21	U	0.22	U	0.24	U	1.1	U
Aroclor-1260	ug/L	0.22	U	0.21	U	0.22	U	0.24	U	1.1	U

Analytical Data Summary

	StationID	SWMU6-MW04		NDW06MW01		NDW06MW02		NDW06MW03		NDW06MW04	
	SampleID	MU6MW04DUP		NDW06GW01-R01		NDW06GW02-R01		NDW06GW03-R01		NDW06GW04-R01	
	Date Collected	07/09/02		09/05/03		09/05/03		09/05/03		09/07/03	
	SampleType	FD		N		N		N		N	
Parameter	Units										
Aroclor-1016	ug/L	1.1	U	1	U	1	U	1	U	1	U
Aroclor-1221	ug/L	1.1	U	0.2	U	0.2	U	0.2	U	0.2	U
Aroclor-1232	ug/L	1.1	U	0.4	U	0.4	U	0.4	U	0.4	U
Aroclor-1242	ug/L	1.1	U	0.2	U	0.2	U	0.2	U	0.2	U
Aroclor-1248	ug/L	1.1	U	0.2	U	0.2	U	0.2	U	0.2	U
Aroclor-1254	ug/L	1.1	U	0.2	U	0.2	U	0.2	U	0.2	U
Aroclor-1260	ug/L	1.1	U	0.2	U	0.2	U	0.2	U	0.2	U

Analytical Data Summary

	StationID	NDW06MW05		NDW06MW05		NDW06MW06		NDW06MW07		NDW06MW08	
	SampleID	NDW06FD01P-R01		NDW06GW05-R01		NDW06GW06-R01		NDW06GW07-R01		NDW06GW08-R01	
	Date Collected	09/05/03		09/05/03		09/05/03		09/07/03		09/07/03	
	SampleType	FD		N		N		N		N	
Parameter	Units										
Aroclor-1016	ug/L	1	U	1	U	1	U	1	U	2.9	U
Aroclor-1221	ug/L	0.2	U	0.2	U	0.2	U	0.2	U	0.59	U
Aroclor-1232	ug/L	0.41	U	0.4	U	0.41	U	0.4	U	1.2	U
Aroclor-1242	ug/L	0.2	U	0.2	U	0.2	U	0.2	U	0.59	U
Aroclor-1248	ug/L	0.2	U	0.2	U	0.2	U	0.2	U	0.59	U
Aroclor-1254	ug/L	0.2	U	0.2	U	0.2	U	0.2	U	0.59	U
Aroclor-1260	ug/L	0.2	U	0.2	U	0.2	U	0.2	U	0.59	U

Analytical Data Summary

	StationID	SWMU6-MW01		SWMU6-MW02		SWMU6-MW03		SWMU6-MW04	
	SampleID	NDA006		NDA008		NDA009		NDA005	
	Date Collected	05/02/00		05/02/00		05/02/00		05/02/00	
	SampleType	N		N		N		N	
Parameter	Units								
Aldrin	ug/L	0.01	U	0.01	UJ	0.01	U	0.01	U
Alpha bhc (alpha hexachlorocyclohexane)	ug/L	0.01	UJ	0.01	UJ	0.01	UJ	0.01	UJ
Beta bhc (beta hexachlorocyclohexane)	ug/L	0.01	U	0.01	UJ	0.01	U	0.01	U
Delta bhc (delta hexachlorocyclohexane)	ug/L	0.01	U	0.01	UJ	0.01	U	0.01	U
Gamma bhc (lindane)	ug/L	0.01	UJ	0.01	UJ	0.01	UJ	0.01	UJ
Alpha-chlordane	ug/L	0.01	U	0.01	UJ	0.01	U	0.01	U
Gamma-chlordane	ug/L	0.01	U	0.01	UJ	0.01	U	0.01	U
p,p'-DDD	ug/L	0.02	U	0.02	UJ	0.02	U	0.02	U
p,p'-DDE	ug/L	0.02	U	0.02	UJ	0.02	U	0.02	U
p,p'-DDT	ug/L	0.02	U	0.02	UJ	0.02	U	0.02	U
Dieldrin	ug/L	0.02	U	0.02	UJ	0.02	U	0.02	U
Alpha endosulfan	ug/L	0.01	U	0.01	UJ	0.01	U	0.01	U
Beta endosulfan	ug/L	0.02	U	0.02	UJ	0.02	U	0.02	U
Endosulfan sulfate	ug/L	0.02	U	0.02	UJ	0.02	U	0.02	U
Endrin	ug/L	0.02	U	0.02	UJ	0.02	U	0.02	U
Endrin aldehyde	ug/L	0.02	U	0.02	UJ	0.02	U	0.02	U
Endrin ketone	ug/L	0.02	U	0.02	UJ	0.02	U	0.02	U
Heptachlor epoxide	ug/L	0.01	U	0.01	UJ	0.01	U	0.01	U
Heptachlor	ug/L	0.01	U	0.01	UJ	0.01	U	0.01	U
Methoxychlor	ug/L	0.11	U	0.11	UJ	0.11	U	0.12	U
Toxaphene	ug/L	1.1	U	1.1	UJ	1.1	U	1.2	U

Analytical Data Summary

	StationID	NDW06MW01		NDW06MW02		NDW06MW03		NDW06MW04	
	SampleID	NDW06GW01-R01		NDW06GW02-R01		NDW06GW03-R01		NDW06GW04-R01	
	Date Collected	09/05/03		09/05/03		09/05/03		09/07/03	
	SampleType	N		N		N		N	
Parameter	Units								
Aldrin	ug/L	0.01	U	0.01	U	0.01	U	0.01	U
Alpha bhc (alpha hexachlorocyclohexane)	ug/L	0.01	U	0.01	U	0.01	U	0.01	U
Beta bhc (beta hexachlorocyclohexane)	ug/L	0.01	U	0.01	U	0.01	U	0.01	U
Delta bhc (delta hexachlorocyclohexane)	ug/L	0.01	U	0.01	U	0.01	U	0.01	U
Gamma bhc (lindane)	ug/L	0.01	U	0.01	U	0.01	U	0.01	U
Alpha-chlordane	ug/L	0.01	U	0.01	U	0.01	U	0.01	U
Gamma-chlordane	ug/L	0.01	U	0.01	U	0.01	U	0.01	U
p,p'-DDD	ug/L	0.02	U	0.02	U	0.02	U	0.02	U
p,p'-DDE	ug/L	0.02	U	0.02	U	0.02	U	0.02	U
p,p'-DDT	ug/L	0.02	U	0.02	U	0.02	U	0.02	U
Dieldrin	ug/L	0.02	U	0.02	U	0.02	U	0.02	U
Alpha endosulfan	ug/L	0.01	U	0.01	U	0.01	U	0.01	U
Beta endosulfan	ug/L	0.02	U	0.02	U	0.02	U	0.02	U
Endosulfan sulfate	ug/L	0.02	U	0.02	U	0.02	U	0.02	U
Endrin	ug/L	0.02	U	0.02	U	0.02	U	0.02	U
Endrin aldehyde	ug/L	0.02	U	0.02	U	0.02	U	0.02	U
Endrin ketone	ug/L	0.02	U	0.02	U	0.02	U	0.02	U
Heptachlor epoxide	ug/L	0.01	U	0.01	U	0.01	U	0.01	U
Heptachlor	ug/L	0.01	U	0.01	U	0.01	U	0.01	U
Methoxychlor	ug/L	0.1	U	0.1	U	0.1	U	0.1	U
Toxaphene	ug/L	0.05	UJ	0.05	UJ	0.05	UJ	0.05	U

Analytical Data Summary

	StationID	NDW06MW05		NDW06MW05		NDW06MW06		NDW06MW07	
	SampleID	NDW06FD01P-R01		NDW06GW05-R01		NDW06GW06-R01		NDW06GW07-R01	
	Date Collected	09/05/03		09/05/03		09/05/03		09/07/03	
	SampleType	FD		N		N		N	
Parameter	Units								
Aldrin	ug/L	0.01	U	0.1	U	0.01	U	0.01	U
Alpha bhc (alpha hexachlorocyclohexane)	ug/L	0.01	U	0.1	U	0.01	U	0.01	U
Beta bhc (beta hexachlorocyclohexane)	ug/L	0.01	U	0.1	U	0.01	U	0.01	U
Delta bhc (delta hexachlorocyclohexane)	ug/L	0.01	U	0.1	U	0.01	U	0.01	U
Gamma bhc (lindane)	ug/L	0.01	U	0.1	U	0.01	U	0.01	U
Alpha-chlordane	ug/L	0.01	U	0.1	U	0.01	U	0.01	U
Gamma-chlordane	ug/L	0.01	U	0.1	U	0.01	U	0.01	U
p,p'-DDD	ug/L	0.02	U	0.2	U	0.02	U	0.02	U
p,p'-DDE	ug/L	0.02	U	0.2	U	0.02	U	0.02	U
p,p'-DDT	ug/L	0.02	U	0.2	U	0.02	U	0.02	U
Dieldrin	ug/L	0.02	U	0.2	U	0.02	U	0.02	U
Alpha endosulfan	ug/L	0.01	U	0.1	U	0.01	U	0.01	U
Beta endosulfan	ug/L	0.02	U	0.2	U	0.02	U	0.02	U
Endosulfan sulfate	ug/L	0.02	U	0.2	U	0.02	U	0.02	U
Endrin	ug/L	0.02	U	0.2	U	0.02	U	0.02	U
Endrin aldehyde	ug/L	0.02	U	0.2	U	0.02	U	0.02	U
Endrin ketone	ug/L	0.02	U	0.2	U	0.02	U	0.02	U
Heptachlor epoxide	ug/L	0.01	U	0.1	U	0.01	U	0.01	U
Heptachlor	ug/L	0.01	U	0.1	U	0.01	U	0.01	U
Methoxychlor	ug/L	0.1	U	1	U	0.1	U	0.1	U
Toxaphene	ug/L	0.051	UJ	0.5	UJ	0.051	UJ	0.05	U

Analytical Data Summary

	StationID	NDW06MW08	
	SampleID	NDW06GW08-R01	
	Date Collected	09/07/03	
	SampleType	N	
Parameter	Units		
Aldrin	ug/L	0.029	U
Alpha bhc (alpha hexachlorocyclohexane)	ug/L	0.029	U
Beta bhc (beta hexachlorocyclohexane)	ug/L	0.029	U
Delta bhc (delta hexachlorocyclohexane)	ug/L	0.029	U
Gamma bhc (lindane)	ug/L	0.029	U
Alpha-chlordane	ug/L	0.029	U
Gamma-chlordane	ug/L	0.029	U
p,p'-DDD	ug/L	0.059	U
p,p'-DDE	ug/L	0.059	U
p,p'-DDT	ug/L	0.059	U
Dieldrin	ug/L	0.059	U
Alpha endosulfan	ug/L	0.029	U
Beta endosulfan	ug/L	0.059	U
Endosulfan sulfate	ug/L	0.059	U
Endrin	ug/L	0.059	U
Endrin aldehyde	ug/L	0.059	U
Endrin ketone	ug/L	0.059	U
Heptachlor epoxide	ug/L	0.029	U
Heptachlor	ug/L	0.029	U
Methoxychlor	ug/L	0.29	U
Toxaphene	ug/L	0.15	U

Analytical Data Summary

	StationID	SWMU6-MW01		SWMU6-MW02		SWMU6-MW03		SWMU6-MW04	
	SampleID	NDA006		NDA008		NDA009		NDA005	
	Date Collected	05/02/00		05/02/00		05/02/00		05/02/00	
	SampleType	N		N		N		N	
Parameter	Units								
1,2,4,5-TETRACHLOROBENZENE	ug/L								
2,4,5-TRICHLOROPHENOL	ug/L	22	U	22	U	24	U	24	U
2,4,6-TRICHLOROPHENOL	ug/L	6	U	6	U	6	U	6	U
2,4-DICHLOROPHENOL	ug/L	6	U	6	U	6	U	6	U
2,4-DIMETHYLPHENOL	ug/L	6	U	6	U	6	U	6	U
2,4-DINITROPHENOL	ug/L	22	U	22	U	24	U	24	U
2,4-DINITROTOLUENE	ug/L	6	U	6	U	6	U	6	U
2,6-DINITROTOLUENE	ug/L	6	U	6	U	6	U	6	U
2-CHLORONAPHTHALENE	ug/L	6	U	6	U	6	U	6	U
2-CHLOROPHENOL	ug/L	6	U	6	U	6	U	6	U
2-METHYLNAPHTHALENE	ug/L	6	U	6	U	6	U	6	U
2-METHYLPHENOL (o-CRESOL)	ug/L	6	U	6	U	6	U	6	U
2-NITROANILINE	ug/L	22	U	22	U	24	U	24	U
2-NITROPHENOL	ug/L	6	U	6	U	6	U	6	U
3,3'-DICHLOROBENZIDINE	ug/L	6	U	6	U	6	U	6	U
3-NITROANILINE	ug/L	22	U	22	U	24	U	24	U
4,6-DINITRO-2-METHYLPHENOL	ug/L	22	U	22	U	24	U	24	U
4-BROMOPHENYL PHENYL ETHER	ug/L	6	U	6	U	6	U	6	U
4-CHLORO-3-METHYLPHENOL	ug/L	6	U	6	U	6	U	6	U
4-CHLOROANILINE	ug/L	6	U	6	U	6	U	6	U
4-CHLOROPHENYL PHENYL ETHER	ug/L	6	U	6	U	6	U	6	U
4-METHYLPHENOL (p-CRESOL)	ug/L								
4-NITROANILINE	ug/L	22	U	22	U	24	U	24	U
4-NITROPHENOL	ug/L	22	U	22	U	24	U	24	U
ACENAPHTHENE	ug/L	6	U	6	U	6	U	6	U
ACENAPHTHYLENE	ug/L	6	U	6	U	6	U	6	U
ACETOPHENONE	ug/L								
ANTHRACENE	ug/L	6	U	6	U	6	U	6	U
ATRAZINE	ug/L								
BENZALDEHYDE	ug/L								
BENZO(a)ANTHRACENE	ug/L	6	U	6	U	6	U	6	U
BENZO(a)PYRENE	ug/L	6	U	6	U	6	U	6	U
BENZO(b)FLUORANTHENE	ug/L	6	U	6	U	6	U	6	U
BENZO(g,h,i)PERYLENE	ug/L	6	U	6	U	6	U	6	U
BENZO(k)FLUORANTHENE	ug/L	6	U	6	U	6	U	6	U
BENZYL BUTYL PHTHALATE	ug/L	6	U	6	U	6	U	6	U
BIPHENYL (DIPHENYL)	ug/L								

Analytical Data Summary

	StationID	NDW06MW01		NDW06MW02		NDW06MW03		NDW06MW04	
	SampleID	NDW06GW01-R01		NDW06GW02-R01		NDW06GW03-R01		NDW06GW04-R01	
	Date Collected	09/05/03		09/05/03		09/05/03		09/07/03	
	SampleType	N		N		N		N	
Parameter	Units								
1,2,4,5-TETRACHLOROBENZENE	ug/L	5.1	U	5.2	U	5.1	U	5.2	U
2,4,5-TRICHLOROPHENOL	ug/L	20.4	U	20.8	U	20.4	U	20.6	U
2,4,6-TRICHLOROPHENOL	ug/L	5.1	U	5.2	U	5.1	U	5.2	U
2,4-DICHLOROPHENOL	ug/L	5.1	U	5.2	U	5.1	U	5.2	U
2,4-DIMETHYLPHENOL	ug/L	5.1	U	5.2	U	5.1	U	5.2	U
2,4-DINITROPHENOL	ug/L	20.4	UJ	20.8	UJ	20.4	UJ	20.6	U
2,4-DINITROTOLUENE	ug/L	5.1	U	5.2	U	5.1	U	5.2	U
2,6-DINITROTOLUENE	ug/L	5.1	U	5.2	U	5.1	U	5.2	U
2-CHLORONAPHTHALENE	ug/L	5.1	U	5.2	U	5.1	U	5.2	U
2-CHLOROPHENOL	ug/L	5.1	U	5.2	U	5.1	U	5.2	U
2-METHYLNAPHTHALENE	ug/L	0.45	J	5.2	U	5.1	U	5.2	U
2-METHYLPHENOL (o-CRESOL)	ug/L	5.1	U	5.2	U	5.1	U	5.2	U
2-NITROANILINE	ug/L	20.4	U	20.8	U	20.4	U	20.6	U
2-NITROPHENOL	ug/L	5.1	U	5.2	U	5.1	U	5.2	U
3,3'-DICHLOROBENZIDINE	ug/L	5.1	U	5.2	U	5.1	U	5.2	U
3-NITROANILINE	ug/L	20.4	U	20.8	U	20.4	U	20.6	U
4,6-DINITRO-2-METHYLPHENOL	ug/L	20.4	U	20.8	U	20.4	U	20.6	U
4-BROMOPHENYL PHENYL ETHER	ug/L	5.1	U	5.2	U	5.1	U	5.2	U
4-CHLORO-3-METHYLPHENOL	ug/L	5.1	U	5.2	U	5.1	U	5.2	U
4-CHLOROANILINE	ug/L	5.1	U	5.2	U	5.1	U	5.2	U
4-CHLOROPHENYL PHENYL ETHER	ug/L	5.1	U	5.2	U	5.1	U	5.2	U
4-METHYLPHENOL (p-CRESOL)	ug/L	5.1	U	5.2	U	5.1	U	5.2	U
4-NITROANILINE	ug/L	20.4	U	20.8	U	20.4	U	20.6	U
4-NITROPHENOL	ug/L	20.4	U	20.8	U	20.4	U	20.6	U
ACENAPHTHENE	ug/L	5.1	U	5.2	U	5.1	U	5.2	U
ACENAPHTHYLENE	ug/L	5.1	U	5.2	U	5.1	U	5.2	U
ACETOPHENONE	ug/L	5.1	U	5.2	U	5.1	U	5.2	U
ANTHRACENE	ug/L	5.1	U	5.2	U	5.1	U	5.2	U
ATRAZINE	ug/L	5.1	U	5.2	U	5.1	U	5.2	U
BENZALDEHYDE	ug/L	5.1	U	5.2	U	5.1	U	5.2	U
BENZO(a)ANTHRACENE	ug/L	5.1	U	5.2	U	5.1	U	5.2	U
BENZO(a)PYRENE	ug/L	5.1	U	5.2	U	5.1	U	5.2	U
BENZO(b)FLUORANTHENE	ug/L	5.1	U	5.2	U	5.1	U	5.2	U
BENZO(g,h,i)PERYLENE	ug/L	5.1	U	5.2	U	5.1	U	5.2	U
BENZO(k)FLUORANTHENE	ug/L	5.1	U	5.2	U	5.1	U	5.2	U
BENZYL BUTYL PHTHALATE	ug/L	5.1	U	5.2	U	5.1	U	5.2	U
BIPHENYL (DIPHENYL)	ug/L	5.1	U	5.2	U	5.1	U	5.2	U

Analytical Data Summary

	StationID	NDW06MW05		NDW06MW05		NDW06MW06		NDW06MW07	
	SampleID	NDW06FD01P-R01		NDW06GW05-R01		NDW06GW06-R01		NDW06GW07-R01	
	Date Collected	09/05/03		09/05/03		09/05/03		09/07/03	
	SampleType	FD		N		N		N	
Parameter	Units								
1,2,4,5-TETRACHLOROBENZENE	ug/L	5.1	U	5.3	U	5.2	U	5.1	U
2,4,5-TRICHLOROPHENOL	ug/L	20.4	U	21.3	U	20.8	U	20.4	U
2,4,6-TRICHLOROPHENOL	ug/L	5.1	U	5.3	U	5.2	U	5.1	U
2,4-DICHLOROPHENOL	ug/L	5.1	U	5.3	U	5.2	U	5.1	U
2,4-DIMETHYLPHENOL	ug/L	5.1	U	5.3	U	5.2	U	5.1	U
2,4-DINITROPHENOL	ug/L	20.4	UJ	21.3	UJ	20.8	UJ	20.4	U
2,4-DINITROTOLUENE	ug/L	5.1	U	5.3	U	5.2	U	5.1	U
2,6-DINITROTOLUENE	ug/L	5.1	U	5.3	U	5.2	U	5.1	U
2-CHLORONAPHTHALENE	ug/L	5.1	U	5.3	U	5.2	U	5.1	U
2-CHLOROPHENOL	ug/L	5.1	U	5.3	U	5.2	U	5.1	U
2-METHYLNAPHTHALENE	ug/L	5.1	U	5.3	U	5.2	U	5.1	U
2-METHYLPHENOL (o-CRESOL)	ug/L	5.1	U	5.3	U	5.2	U	5.1	U
2-NITROANILINE	ug/L	20.4	U	21.3	U	20.8	U	20.4	U
2-NITROPHENOL	ug/L	5.1	U	5.3	U	5.2	U	5.1	U
3,3'-DICHLOROBENZIDINE	ug/L	5.1	U	5.3	U	5.2	U	5.1	U
3-NITROANILINE	ug/L	20.4	U	21.3	U	20.8	U	20.4	U
4,6-DINITRO-2-METHYLPHENOL	ug/L	20.4	U	21.3	U	20.8	U	20.4	U
4-BROMOPHENYL PHENYL ETHER	ug/L	5.1	U	5.3	U	5.2	U	5.1	U
4-CHLORO-3-METHYLPHENOL	ug/L	5.1	U	5.3	U	5.2	U	5.1	U
4-CHLOROANILINE	ug/L	5.1	U	5.3	U	5.2	U	5.1	U
4-CHLOROPHENYL PHENYL ETHER	ug/L	5.1	U	5.3	U	5.2	U	5.1	U
4-METHYLPHENOL (p-CRESOL)	ug/L	5.1	U	5.3	U	5.2	U	5.1	U
4-NITROANILINE	ug/L	20.4	U	21.3	U	20.8	U	20.4	U
4-NITROPHENOL	ug/L	20.4	U	21.3	U	20.8	U	20.4	U
ACENAPHTHENE	ug/L	5.1	U	5.3	U	5.2	U	5.1	U
ACENAPHTHYLENE	ug/L	5.1	U	5.3	U	5.2	U	5.1	U
ACETOPHENONE	ug/L	5.1	U	5.3	U	5.2	U	5.1	U
ANTHRACENE	ug/L	5.1	U	5.3	U	5.2	U	5.1	U
ATRAZINE	ug/L	5.1	U	5.3	U	5.2	U	5.1	U
BENZALDEHYDE	ug/L	5.1	U	5.3	U	5.2	U	5.1	U
BENZO(a)ANTHRACENE	ug/L	5.1	U	5.3	U	5.2	U	5.1	U
BENZO(a)PYRENE	ug/L	5.1	U	5.3	U	5.2	U	5.1	U
BENZO(b)FLUORANTHENE	ug/L	5.1	U	5.3	U	5.2	U	5.1	U
BENZO(g,h,i)PERYLENE	ug/L	5.1	U	5.3	U	5.2	U	5.1	U
BENZO(k)FLUORANTHENE	ug/L	5.1	U	5.3	U	5.2	U	5.1	U
BENZYL BUTYL PHTHALATE	ug/L	5.1	U	5.3	U	5.2	U	5.1	U
BIPHENYL (DIPHENYL)	ug/L	5.1	U	5.3	U	5.2	U	5.1	U

Analytical Data Summary

	StationID	NDW06MW08	
	SampleID	NDW06GW08-R01	
	Date Collected	09/07/03	
	SampleType	N	
Parameter	Units		
1,2,4,5-TETRACHLOROBENZENE	ug/L	5.1	U
2,4,5-TRICHLOROPHENOL	ug/L	20.4	U
2,4,6-TRICHLOROPHENOL	ug/L	5.1	U
2,4-DICHLOROPHENOL	ug/L	5.1	U
2,4-DIMETHYLPHENOL	ug/L	5.1	U
2,4-DINITROPHENOL	ug/L	20.4	U
2,4-DINITROTOLUENE	ug/L	5.1	U
2,6-DINITROTOLUENE	ug/L	5.1	U
2-CHLORONAPHTHALENE	ug/L	5.1	U
2-CHLOROPHENOL	ug/L	5.1	U
2-METHYLNAPHTHALENE	ug/L	5.1	U
2-METHYLPHENOL (o-CRESOL)	ug/L	5.1	U
2-NITROANILINE	ug/L	20.4	U
2-NITROPHENOL	ug/L	5.1	U
3,3'-DICHLOROBENZIDINE	ug/L	5.1	U
3-NITROANILINE	ug/L	20.4	U
4,6-DINITRO-2-METHYLPHENOL	ug/L	20.4	U
4-BROMOPHENYL PHENYL ETHER	ug/L	5.1	U
4-CHLORO-3-METHYLPHENOL	ug/L	5.1	U
4-CHLOROANILINE	ug/L	5.1	U
4-CHLOROPHENYL PHENYL ETHER	ug/L	5.1	U
4-METHYLPHENOL (p-CRESOL)	ug/L	5.1	U
4-NITROANILINE	ug/L	20.4	U
4-NITROPHENOL	ug/L	20.4	U
ACENAPHTHENE	ug/L	5.1	U
ACENAPHTHYLENE	ug/L	5.1	U
ACETOPHENONE	ug/L	5.1	U
ANTHRACENE	ug/L	5.1	U
ATRAZINE	ug/L	5.1	U
BENZALDEHYDE	ug/L	5.1	U
BENZO(a)ANTHRACENE	ug/L	5.1	U
BENZO(a)PYRENE	ug/L	5.1	U
BENZO(b)FLUORANTHENE	ug/L	5.1	U
BENZO(g,h,i)PERYLENE	ug/L	5.1	U
BENZO(k)FLUORANTHENE	ug/L	5.1	U
BENZYL BUTYL PHTHALATE	ug/L	5.1	U
BIPHENYL (DIPHENYL)	ug/L	5.1	U

Analytical Data Summary

	StationID	SWMU6-MW01		SWMU6-MW02		SWMU6-MW03		SWMU6-MW04	
	SampleID	NDA006		NDA008		NDA009		NDA005	
	Date Collected	05/02/00		05/02/00		05/02/00		05/02/00	
	SampleType	N		N		N		N	
Parameter	Units								
bis(2-CHLOROETHOXY) METHANE	ug/L	6	U	6	U	6	U	6	U
bis(2-CHLOROETHYL) ETHER (2-CHLOROETHYL	ug/L	6	U	6	U	6	U	6	U
bis(2-CHLOROISOPROPYL) ETHER	ug/L	6	U	6	U	6	U	6	U
bis(2-ETHYLHEXYL) PHTHALATE	ug/L	6	U	6	U	6	U	6	U
CAPROLACTAM	ug/L								
CARBAZOLE	ug/L	6	U	6	U	6	U	6	U
CHRYSENE	ug/L	6	U	6	U	6	U	6	U
CRESOLS, m & p	ug/L	6	U	6	U	6	U	6	U
DI-n-BUTYL PHTHALATE	ug/L	6	U	6	U	6	U	6	U
DI-n-OCTYLPHTHALATE	ug/L	6	U	6	U	6	U	6	U
DIBENZ(a,h)ANTHRACENE	ug/L	6	U	6	U	6	U	6	U
DIBENZOFURAN	ug/L	6	U	6	U	6	U	6	U
DIETHYL PHTHALATE	ug/L	6	U	6	U	6	U	6	U
DIMETHYL PHTHALATE	ug/L	6	U	6	U	6	U	6	U
FLUORANTHENE	ug/L	6	U	6	U	6	U	6	U
FLUORENE	ug/L	6	U	6	U	6	U	6	U
HEXACHLOROBENZENE	ug/L	6	U	6	U	6	U	6	U
HEXACHLOROBUTADIENE	ug/L	6	U	6	U	6	U	6	U
HEXACHLOROCYCLOPENTADIENE	ug/L	6	U	6	U	6	U	6	U
HEXACHLOROETHANE	ug/L	6	U	6	U	6	U	6	U
INDENO(1,2,3-c,d)PYRENE	ug/L	6	U	6	U	6	U	6	U
ISOPHORONE	ug/L	6	U	6	U	6	U	6	U
N-NITROSODI-n-PROPYLAMINE	ug/L	6	U	6	U	6	U	6	U
N-NITROSODIPHENYLAMINE	ug/L	6	U	6	U	6	U	6	U
NAPHTHALENE	ug/L	6	U	6	U	6	U	6	U
NITROBENZENE	ug/L	6	U	6	U	6	U	6	U
PENTACHLOROPHENOL	ug/L	22	U	22	U	24	U	24	U
PHENANTHRENE	ug/L	6	U	6	U	6	U	6	U
PHENOL	ug/L	6	U	6	U	6	U	6	U
PYRENE	ug/L	6	U	6	U	6	U	6	U

Analytical Data Summary

	StationID	NDW06MW01		NDW06MW02		NDW06MW03		NDW06MW04	
	SampleID	NDW06GW01-R01		NDW06GW02-R01		NDW06GW03-R01		NDW06GW04-R01	
	Date Collected	09/05/03		09/05/03		09/05/03		09/07/03	
	SampleType	N		N		N		N	
Parameter	Units								
bis(2-CHLOROETHOXY) METHANE	ug/L	5.1	U	5.2	U	5.1	U	5.2	U
bis(2-CHLOROETHYL) ETHER (2-CHLOROETHYL	ug/L	5.1	U	5.2	U	5.1	U	5.2	U
bis(2-CHLOROISOPROPYL) ETHER	ug/L	5.1	U	5.2	U	5.1	U	5.2	U
bis(2-ETHYLHEXYL) PHTHALATE	ug/L	10.2	U	10.4	U	10.2	U	10.3	U
CAPROLACTAM	ug/L	37.4	J	5.2	R	1.3	J	5.2	R
CARBAZOLE	ug/L	10.2	U	10.4	U	10.2	U	10.3	U
CHRYSENE	ug/L	5.1	U	5.2	U	5.1	U	5.2	U
CRESOLS, m & p	ug/L								
DI-n-BUTYL PHTHALATE	ug/L	5.1	U	5.2	U	5.1	U	5.2	U
DI-n-OCTYLPHTHALATE	ug/L	5.1	U	5.2	U	5.1	U	4.9	J
DIBENZ(a,h)ANTHRACENE	ug/L	5.1	U	5.2	U	5.1	U	5.2	U
DIBENZOFURAN	ug/L	5.1	U	5.2	U	5.1	U	5.2	U
DIETHYL PHTHALATE	ug/L	5.1	U	5.2	U	5.1	U	5.2	U
DIMETHYL PHTHALATE	ug/L	5.1	U	5.2	U	5.1	U	5.2	U
FLUORANTHENE	ug/L	5.1	U	5.2	U	5.1	U	5.2	U
FLUORENE	ug/L	5.1	U	5.2	U	5.1	U	5.2	U
HEXACHLOROBENZENE	ug/L	5.1	U	5.2	U	5.1	U	5.2	U
HEXACHLOROBUTADIENE	ug/L	5.1	U	5.2	U	5.1	U	5.2	U
HEXACHLOROCYCLOPENTADIENE	ug/L	5.1	U	5.2	U	5.1	U	5.2	U
HEXACHLOROETHANE	ug/L	5.1	U	5.2	U	5.1	U	5.2	U
INDENO(1,2,3-c,d)PYRENE	ug/L	5.1	U	5.2	U	5.1	U	5.2	U
ISOPHORONE	ug/L	5.1	U	5.2	U	5.1	U	5.2	U
N-NITROSODI-n-PROPYLAMINE	ug/L	5.1	U	5.2	U	5.1	U	5.2	U
N-NITROSODIPHENYLAMINE	ug/L	5.1	U	5.2	U	5.1	U	5.2	U
NAPHTHALENE	ug/L	0.39	J	5.2	U	5.1	U	5.2	U
NITROBENZENE	ug/L	5.1	U	5.2	U	5.1	U	5.2	U
PENTACHLOROPHENOL	ug/L	20.4	U	20.8	U	20.4	U	20.6	U
PHENANTHRENE	ug/L	5.1	U	5.2	U	5.1	U	5.2	U
PHENOL	ug/L	5.1	U	5.2	U	5.1	U	5.2	U
PYRENE	ug/L	5.1	U	5.2	U	5.1	U	5.2	U

Analytical Data Summary

Parameter	Units	StationID		NDW06MW05		NDW06MW06		NDW06MW07	
		SampleID		NDW06FD01P-R01		NDW06GW05-R01		NDW06GW06-R01		NDW06GW07-R01	
		Date Collected		09/05/03		09/05/03		09/05/03		09/07/03	
		SampleType		FD		N		N		N	
bis(2-CHLOROETHOXY) METHANE	ug/L		5.1	U	5.3	U	5.2	U	5.1	U
bis(2-CHLOROETHYL) ETHER (2-CHLOROETHYL	ug/L		5.1	U	5.3	U	5.2	U	5.1	U
bis(2-CHLOROISOPROPYL) ETHER	ug/L		5.1	U	5.3	U	5.2	U	5.1	U
bis(2-ETHYLHEXYL) PHTHALATE	ug/L		10.2	U	10.6	U	10.4	U	10.2	U
CAPROLACTAM	ug/L		5.1	R	5.3	R	5.2	R	5.1	R
CARBAZOLE	ug/L		10.2	U	10.6	U	10.4	U	10.2	U
CHRYSENE	ug/L		5.1	U	5.3	U	5.2	U	5.1	U
CRESOLS, m & p	ug/L									
DI-n-BUTYL PHTHALATE	ug/L		5.1	U	5.3	U	5.2	U	5.1	U
DI-n-OCTYLPHTHALATE	ug/L		5.1	U	5.3	U	5.2	U	5.1	U
DIBENZ(a,h)ANTHRACENE	ug/L		5.1	U	5.3	U	5.2	U	5.1	U
DIBENZOFURAN	ug/L		5.1	U	5.3	U	5.2	U	5.1	U
DIETHYL PHTHALATE	ug/L		5.1	U	5.3	U	5.2	U	5.1	U
DIMETHYL PHTHALATE	ug/L		5.1	U	5.3	U	5.2	U	5.1	U
FLUORANTHENE	ug/L		5.1	U	5.3	U	5.2	U	5.1	U
FLUORENE	ug/L		5.1	U	5.3	U	5.2	U	5.1	U
HEXACHLOROBENZENE	ug/L		5.1	U	5.3	U	5.2	U	5.1	U
HEXACHLOROBUTADIENE	ug/L		5.1	U	5.3	U	5.2	U	5.1	U
HEXACHLOROCYCLOPENTADIENE	ug/L		5.1	U	5.3	U	5.2	U	5.1	U
HEXACHLOROETHANE	ug/L		5.1	U	5.3	U	5.2	U	5.1	U
INDENO(1,2,3-c,d)PYRENE	ug/L		5.1	U	5.3	U	5.2	U	5.1	U
ISOPHORONE	ug/L		5.1	U	5.3	U	5.2	U	5.1	U
N-NITROSODI-n-PROPYLAMINE	ug/L		5.1	U	5.3	U	5.2	U	5.1	U
N-NITROSODIPHENYLAMINE	ug/L		5.1	U	5.3	U	5.2	U	5.1	U
NAPHTHALENE	ug/L		5.1	U	5.3	U	5.2	U	5.1	U
NITROBENZENE	ug/L		5.1	U	5.3	U	5.2	U	5.1	U
PENTACHLOROPHENOL	ug/L		20.4	U	21.3	U	20.8	U	20.4	U
PHENANTHRENE	ug/L		5.1	U	5.3	U	5.2	U	5.1	U
PHENOL	ug/L		5.1	U	5.3	U	5.2	U	5.1	U
PYRENE	ug/L		5.1	U	5.3	U	5.2	U	5.1	U

Analytical Data Summary

	StationID	NDW06MW08	
	SampleID	NDW06GW08-R01	
	Date Collected	09/07/03	
	SampleType	N	
Parameter	Units		
bis(2-CHLOROETHOXY) METHANE	ug/L	5.1	U
bis(2-CHLOROETHYL) ETHER (2-CHLOROETHYL	ug/L	5.1	U
bis(2-CHLOROISOPROPYL) ETHER	ug/L	5.1	U
bis(2-ETHYLHEXYL) PHTHALATE	ug/L	10.2	U
CAPROLACTAM	ug/L	5.1	R
CARBAZOLE	ug/L	10.2	U
CHRYSENE	ug/L	5.1	U
CRESOLS, m & p	ug/L		
DI-n-BUTYL PHTHALATE	ug/L	5.1	U
DI-n-OCTYLPHTHALATE	ug/L	8.1	J
DIBENZ(a,h)ANTHRACENE	ug/L	5.1	U
DIBENZOFURAN	ug/L	5.1	U
DIETHYL PHTHALATE	ug/L	5.1	U
DIMETHYL PHTHALATE	ug/L	5.1	U
FLUORANTHENE	ug/L	5.1	U
FLUORENE	ug/L	5.1	U
HEXACHLOROBENZENE	ug/L	5.1	U
HEXACHLOROBUTADIENE	ug/L	5.1	U
HEXACHLOROCYCLOPENTADIENE	ug/L	5.1	U
HEXACHLOROETHANE	ug/L	5.1	U
INDENO(1,2,3-c,d)PYRENE	ug/L	5.1	U
ISOPHORONE	ug/L	5.1	U
N-NITROSODI-n-PROPYLAMINE	ug/L	5.1	U
N-NITROSODIPHENYLAMINE	ug/L	5.1	U
NAPHTHALENE	ug/L	5.1	U
NITROBENZENE	ug/L	5.1	U
PENTACHLOROPHENOL	ug/L	20.4	U
PHENANTHRENE	ug/L	5.1	U
PHENOL	ug/L	5.1	U
PYRENE	ug/L	5.1	U

Analytical Data Summary

	StationID	SWMU6-MW01		SWMU6-MW02		SWMU6-MW03		SWMU6-MW04	
	SampleID	NDA006		NDA008		NDA009		NDA005	
	Date Collected	05/02/00		05/02/00		05/02/00		05/02/00	
	SampleType	N		N		N		N	
Parameter	Units								
ACETONE	ug/L	5	U	5	U	5	U	5	U
BROMODICHLOROMETHANE	ug/L	1	U	1	U	1	U	1	U
BROMOCHLOROMETHANE	ug/L	1	U	1	U	1	U	1	U
BROMOMETHANE	ug/L	1	U	1	U	1	U	1	U
BENZENE	ug/L	1	U	1	U	1	U	1	U
TOLUENE	ug/L	1	U	1	U	1	U	1	U
CARBON DISULFIDE	ug/L	1	U	1	U	1	U	1	U
METHYLCYCLOHEXANE	ug/L								
CHLOROBENZENE	ug/L	1	U	1	U	1	U	1	U
CHLOROETHANE	ug/L	1	U	1	U	1	U	1	U
CHLOROMETHANE	ug/L	1	U	1	U	1	U	1	U
CARBON TETRACHLORIDE	ug/L	1	U	1	U	1	U	1	U
CYCLOHEXANE	ug/L								
DIBROMOCHLOROMETHANE	ug/L	1	U	1	U	1	U	1	U
1,2-DIBROMO-3-CHLOROPROPANE	ug/L	1	U	1	U	1	U	1	U
1,1-DICHLOROETHANE	ug/L	1	U	1	U	1	U	1	U
1,2-DICHLOROETHANE	ug/L	1	U	1	U	1	U	1	U
1,2-DICHLOROBENZENE	ug/L	1	U	1	U	1	U	1	U
1,3-DICHLOROBENZENE	ug/L	1	U	1	U	1	U	1	U
1,4-DICHLOROBENZENE	ug/L	1	U	1	U	1	U	1	U
1,1-DICHLOROETHENE	ug/L	1	U	1	U	1	U	1	U
cis-1,2-DICHLOROETHYLENE	ug/L	1	U	1	U	1	U	1	U
trans-1,2-DICHLOROETHENE	ug/L	1	U	1	U	1	U	1	U
TOTAL 1,2-DICHLOROETHENE	ug/L	1	U	1	U	1	U	1	U
cis-1,3-DICHLOROPROPENE	ug/L	1	U	1	U	1	U	1	U
trans-1,3-DICHLOROPROPENE	ug/L	1	U	1	U	1	U	1	U
1,2-DICHLOROPROPANE	ug/L	1	U	1	U	1	U	1	U
ETHYLBENZENE	ug/L	1	U	1	U	1	U	1	U
1,2-DIBROMOETHANE (ETHYLENE DIB	ug/L	1	U	1	U	1	U	1	U
1,2-DIBROMOETHANE (ETHYLENE DIB	ug/L								
TRICHLOROFLUOROMETHANE	ug/L								
1,1,2-TRICHLORO-1,2,2-TRIFLUOROET	ug/L								
DICHLORODIFLUOROMETHANE	ug/L								
2-HEXANONE	ug/L	5	U	5	U	5	U	5	U
ISOPROPYLBENZENE (CUMENE)	ug/L								
METHYL ACETATE	ug/L								
METHYL ETHYL KETONE (2-BUTANON	ug/L	5	UJ	5	UJ	5	UJ	5	UJ

Analytical Data Summary

	StationID	NDW06MW01		NDW06MW02		NDW06MW03		NDW06MW04	
	SampleID	NDW06GW01-R01		NDW06GW02-R01		NDW06GW03-R01		NDW06GW04-R01	
	Date Collected	09/05/03		09/05/03		09/05/03		09/07/03	
	SampleType	N		N		N		N	
Parameter	Units								
ACETONE	ug/L	5.5	U	5	U	5	U	5	U
BROMODICHLOROMETHANE	ug/L	0.5	U	0.5	U	0.5	U	0.5	U
BROMOCHLOROMETHANE	ug/L	0.5	U	0.5	U	0.5	U	0.5	U
BROMOMETHANE	ug/L	0.5	U	0.5	U	0.5	U	0.5	U
BENZENE	ug/L	0.5	U	0.5	U	0.5	U	0.5	U
TOLUENE	ug/L	0.8	U	0.92	U	0.94	U	0.5	U
CARBON DISULFIDE	ug/L	0.5	U	0.5	U	0.5	U	0.5	U
METHYLCYCLOHEXANE	ug/L	0.5	U	0.5	U	0.5	U	0.5	U
CHLOROBENZENE	ug/L	0.5	U	0.5	U	0.5	U	0.5	U
CHLOROETHANE	ug/L	0.5	U	0.5	U	0.5	U	0.5	U
CHLOROMETHANE	ug/L	0.5	U	0.5	U	0.5	U	0.5	U
CARBON TETRACHLORIDE	ug/L	0.5	U	0.5	U	0.5	U	0.5	U
CYCLOHEXANE	ug/L	0.5	U	0.5	U	0.5	U	0.5	U
DIBROMOCHLOROMETHANE	ug/L	0.5	U	0.5	U	0.5	U	0.5	U
1,2-DIBROMO-3-CHLOROPROPANE	ug/L	2	U	2	U	2	U	2	R
1,1-DICHLOROETHANE	ug/L	0.5	U	0.5	U	0.5	U	0.5	U
1,2-DICHLOROETHANE	ug/L	0.5	U	0.5	U	0.5	U	0.5	U
1,2-DICHLOROBENZENE	ug/L	0.5	U	0.5	U	0.5	U	0.5	R
1,3-DICHLOROBENZENE	ug/L	0.5	U	0.5	U	0.5	U	0.5	U
1,4-DICHLOROBENZENE	ug/L	0.5	U	0.5	U	0.5	U	0.5	U
1,1-DICHLOROETHENE	ug/L	0.5	U	0.5	U	0.5	U	0.5	U
cis-1,2-DICHLOROETHYLENE	ug/L	0.5	U	0.5	U	0.5	U	0.5	U
trans-1,2-DICHLOROETHENE	ug/L	0.5	U	0.5	U	0.5	U	0.5	U
TOTAL 1,2-DICHLOROETHENE	ug/L								
cis-1,3-DICHLOROPROPENE	ug/L	0.5	U	0.5	U	0.5	U	0.5	U
trans-1,3-DICHLOROPROPENE	ug/L	0.5	U	0.5	U	0.5	U	0.5	U
1,2-DICHLOROPROPANE	ug/L	0.5	U	0.5	U	0.5	U	0.5	U
ETHYLBENZENE	ug/L	0.5	U	0.5	U	0.5	U	0.5	U
1,2-DIBROMOETHANE (ETHYLENE DIB	ug/L								
1,2-DIBROMOETHANE (ETHYLENE DIB	ug/L	0.5	U	0.5	U	0.5	U	0.5	U
TRICHLOROFLUOROMETHANE	ug/L	0.5	U	0.5	U	0.5	U	0.5	U
1,1,2-TRICHLORO-1,2,2-TRIFLUOROET	ug/L	0.5	UJ	0.5	UJ	0.5	UJ	0.5	U
DICHLORODIFLUOROMETHANE	ug/L	0.5	U	0.5	U	0.5	U	0.5	U
2-HEXANONE	ug/L	5	U	5	U	5	U	5	U
ISOPROPYLBENZENE (CUMENE)	ug/L	0.5	U	0.5	U	0.5	U	0.5	R
METHYL ACETATE	ug/L	2	U	2	U	2	U	2	U
METHYL ETHYL KETONE (2-BUTANON	ug/L	5	U	5	U	5	U	5	U

Analytical Data Summary

	StationID	NDW06MW05		NDW06MW05		NDW06MW06		NDW06MW07	
	SampleID	NDW06FD01P-R01		NDW06GW05-R01		NDW06GW06-R01		NDW06GW07-R01	
	Date Collected	09/05/03		09/05/03		09/05/03		09/07/03	
	SampleType	FD		N		N		N	
Parameter	Units								
ACETONE	ug/L	5	U	5	U	5	U	62.3	U
BROMODICHLOROMETHANE	ug/L	0.5	U	0.5	U	0.5	U	0.5	U
BROMOCHLOROMETHANE	ug/L	0.5	U	0.5	U	0.5	U	0.5	U
BROMOMETHANE	ug/L	0.5	U	0.5	U	0.5	U	0.5	U
BENZENE	ug/L	0.5	U	0.5	U	0.5	U	0.5	U
TOLUENE	ug/L	1	U	1.4	U	1	U	0.5	U
CARBON DISULFIDE	ug/L	0.5	U	0.5	U	0.5	U	3.8	=
METHYLCYCLOHEXANE	ug/L	0.5	U	0.5	U	0.5	U	0.5	U
CHLOROBENZENE	ug/L	0.5	U	0.5	U	0.5	U	0.5	U
CHLOROETHANE	ug/L	0.5	U	0.5	U	0.5	U	0.5	U
CHLOROMETHANE	ug/L	0.5	U	0.5	U	0.5	U	0.5	U
CARBON TETRACHLORIDE	ug/L	0.5	U	0.5	U	0.5	U	0.5	U
CYCLOHEXANE	ug/L	0.5	U	0.5	U	0.5	U	0.5	U
DIBROMOCHLOROMETHANE	ug/L	0.5	U	0.5	U	0.5	U	0.5	U
1,2-DIBROMO-3-CHLOROPROPANE	ug/L	2	U	2	U	2	U	2	R
1,1-DICHLOROETHANE	ug/L	0.5	U	0.5	U	0.5	U	0.5	U
1,2-DICHLOROETHANE	ug/L	0.5	U	0.5	U	0.5	U	0.5	U
1,2-DICHLOROBENZENE	ug/L	0.5	U	0.5	U	0.5	U	0.5	R
1,3-DICHLOROBENZENE	ug/L	0.5	U	0.5	U	0.5	U	0.5	U
1,4-DICHLOROBENZENE	ug/L	0.5	U	0.5	U	0.5	U	0.5	U
1,1-DICHLOROETHENE	ug/L	0.5	U	0.5	U	0.5	U	0.5	U
cis-1,2-DICHLOROETHYLENE	ug/L	0.5	U	0.5	U	0.5	U	0.5	U
trans-1,2-DICHLOROETHENE	ug/L	0.5	U	0.5	U	0.5	U	0.5	U
TOTAL 1,2-DICHLOROETHENE	ug/L								
cis-1,3-DICHLOROPROPENE	ug/L	0.5	U	0.5	U	0.5	U	0.5	U
trans-1,3-DICHLOROPROPENE	ug/L	0.5	U	0.5	U	0.5	U	0.5	U
1,2-DICHLOROPROPANE	ug/L	0.5	U	0.5	U	0.5	U	0.5	U
ETHYLBENZENE	ug/L	0.5	U	0.5	U	0.5	U	0.5	U
1,2-DIBROMOETHANE (ETHYLENE DIB	ug/L								
1,2-DIBROMOETHANE (ETHYLENE DIB	ug/L	0.5	U	0.5	U	0.5	U	0.5	U
TRICHLOROFLUOROMETHANE	ug/L	0.5	U	0.5	U	0.5	U	0.5	U
1,1,2-TRICHLORO-1,2,2-TRIFLUOROET	ug/L	0.5	UJ	0.5	UJ	0.5	UJ	0.5	U
DICHLORODIFLUOROMETHANE	ug/L	0.5	U	0.5	U	0.5	U	0.5	U
2-HEXANONE	ug/L	5	U	5	U	5	U	5	U
ISOPROPYLBENZENE (CUMENE)	ug/L	0.5	U	0.5	U	0.5	U	0.5	R
METHYL ACETATE	ug/L	2	U	2	U	2	U	2	U
METHYL ETHYL KETONE (2-BUTANON	ug/L	5	U	5	U	5	U	5	U

Analytical Data Summary

	StationID	NDW06MW08	
	SampleID	NDW06GW08-R01	
	Date Collected	09/07/03	
	SampleType	N	
Parameter	Units		
ACETONE	ug/L	5	U
BROMODICHLOROMETHANE	ug/L	0.5	U
BROMOCHLOROMETHANE	ug/L	0.5	U
BROMOMETHANE	ug/L	0.5	U
BENZENE	ug/L	0.5	U
TOLUENE	ug/L	0.5	U
CARBON DISULFIDE	ug/L	0.5	U
METHYLCYCLOHEXANE	ug/L	0.5	U
CHLOROBENZENE	ug/L	0.5	U
CHLOROETHANE	ug/L	0.5	U
CHLOROMETHANE	ug/L	0.5	U
CARBON TETRACHLORIDE	ug/L	0.5	U
CYCLOHEXANE	ug/L	0.5	U
DIBROMOCHLOROMETHANE	ug/L	0.5	U
1,2-DIBROMO-3-CHLOROPROPANE	ug/L	2	R
1,1-DICHLOROETHANE	ug/L	0.5	U
1,2-DICHLOROETHANE	ug/L	0.5	U
1,2-DICHLOROBENZENE	ug/L	0.5	R
1,3-DICHLOROBENZENE	ug/L	0.5	U
1,4-DICHLOROBENZENE	ug/L	0.5	U
1,1-DICHLOROETHENE	ug/L	0.5	U
cis-1,2-DICHLOROETHYLENE	ug/L	0.5	U
trans-1,2-DICHLOROETHENE	ug/L	0.5	U
TOTAL 1,2-DICHLOROETHENE	ug/L		
cis-1,3-DICHLOROPROPENE	ug/L	0.5	U
trans-1,3-DICHLOROPROPENE	ug/L	0.5	U
1,2-DICHLOROPROPANE	ug/L	0.5	U
ETHYLBENZENE	ug/L	0.5	U
1,2-DIBROMOETHANE (ETHYLENE DIB	ug/L		
1,2-DIBROMOETHANE (ETHYLENE DIB	ug/L	0.5	U
TRICHLOROFLUOROMETHANE	ug/L	0.5	U
1,1,2-TRICHLORO-1,2,2-TRIFLUOROET	ug/L	0.5	U
DICHLORODIFLUOROMETHANE	ug/L	0.5	U
2-HEXANONE	ug/L	5	U
ISOPROPYLBENZENE (CUMENE)	ug/L	0.5	R
METHYL ACETATE	ug/L	2	U
METHYL ETHYL KETONE (2-BUTANON	ug/L	5	U

Analytical Data Summary

	StationID	SWMU6-MW01		SWMU6-MW02		SWMU6-MW03		SWMU6-MW04	
	SampleID	NDA006		NDA008		NDA009		NDA005	
	Date Collected	05/02/00		05/02/00		05/02/00		05/02/00	
	SampleType	N		N		N		N	
Parameter	Units								
METHYL ISOBUTYL KETONE (4-METH\	ug/L	5	U	5	U	5	U	5	U
METHYLENE CHLORIDE	ug/L	2	U	2	U	2	U	2	U
1,1,2,2-TETRACHLOROETHANE	ug/L	1	U	1	U	1	U	1	U
TETRACHLOROETHYLENE(PCE)	ug/L	1	UJ	1	UJ	1	UJ	1	UJ
STYRENE	ug/L	1	U	1	U	1	U	1	U
BROMOFORM	ug/L	1	U	1	U	1	U	1	U
tert-BUTYL METHYL ETHER	ug/L								
1,1,1-TRICHLOROETHANE	ug/L	1	U	1	U	1	U	1	U
1,1,2-TRICHLOROETHANE	ug/L	1	U	1	U	1	U	1	U
1,2,3-TRICHLOROBENZENE	ug/L								
1,2,4-TRICHLOROBENZENE	ug/L	1	U	1	U	1	U	1	U
TRICHLOROETHYLENE (TCE)	ug/L	1	U	1	U	1	U	1	U
CHLOROFORM	ug/L	1	U	1	U	1	U	1	U
VINYL CHLORIDE	ug/L	1	U	1	U	1	U	1	U
XYLENES, TOTAL	ug/L	1	U	1	U	1	U	1	U
M,P-XYLENE (SUM OF ISOMERS)	ug/L	1	U	1	U	1	U	1	U
O-XYLENE (1,2-DIMETHYLBENZENE)	ug/L	1	U	1	U	1	U	1	U

Analytical Data Summary

	StationID	NDW06MW01		NDW06MW02		NDW06MW03		NDW06MW04	
	SampleID	NDW06GW01-R01		NDW06GW02-R01		NDW06GW03-R01		NDW06GW04-R01	
	Date Collected	09/05/03		09/05/03		09/05/03		09/07/03	
	SampleType	N		N		N		N	
Parameter	Units								
METHYL ISOBUTYL KETONE (4-METHY	ug/L	5	U	5	U	5	U	5	U
METHYLENE CHLORIDE	ug/L	0.5	U	0.5	U	0.5	U	0.5	U
1,1,2,2-TETRACHLOROETHANE	ug/L	0.5	U	0.5	U	0.5	U	0.5	U
TETRACHLOROETHYLENE(PCE)	ug/L	0.5	U	0.5	U	0.5	U	0.5	U
STYRENE	ug/L	0.5	U	0.5	U	0.5	U	0.5	U
BROMOFORM	ug/L	0.5	U	0.5	U	0.5	U	0.5	U
tert-BUTYL METHYL ETHER	ug/L	0.5	U	0.5	U	0.5	U	0.5	U
1,1,1-TRICHLOROETHANE	ug/L	0.5	U	0.5	U	0.5	U	0.5	U
1,1,2-TRICHLOROETHANE	ug/L	0.5	U	0.5	U	0.5	U	0.5	U
1,2,3-TRICHLOROBENZENE	ug/L	0.5	U	0.5	U	0.5	U	0.5	U
1,2,4-TRICHLOROBENZENE	ug/L	0.5	U	0.5	U	0.5	U	0.5	U
TRICHLOROETHYLENE (TCE)	ug/L	0.5	U	0.5	U	0.5	U	0.5	U
CHLOROFORM	ug/L	1.1	=	0.5	U	0.5	U	0.5	U
VINYL CHLORIDE	ug/L	0.5	U	0.5	U	0.5	U	0.5	U
XYLENES, TOTAL	ug/L	2	U	2	U	2	U	2	U
M,P-XYLENE (SUM OF ISOMERS)	ug/L								
O-XYLENE (1,2-DIMETHYLBENZENE)	ug/L								

Analytical Data Summary

	StationID	NDW06MW05		NDW06MW05		NDW06MW06		NDW06MW07	
	SampleID	NDW06FD01P-R01		NDW06GW05-R01		NDW06GW06-R01		NDW06GW07-R01	
	Date Collected	09/05/03		09/05/03		09/05/03		09/07/03	
	SampleType	FD		N		N		N	
Parameter	Units								
METHYL ISOBUTYL KETONE (4-METHY	ug/L	5	U	5	U	5	U	5	U
METHYLENE CHLORIDE	ug/L	0.5	U	0.5	U	0.5	U	0.5	U
1,1,2,2-TETRACHLOROETHANE	ug/L	0.5	U	0.5	U	0.5	U	0.5	U
TETRACHLOROETHYLENE(PCE)	ug/L	0.5	U	0.5	U	0.5	U	0.5	U
STYRENE	ug/L	0.5	U	0.5	U	0.5	U	0.5	U
BROMOFORM	ug/L	0.5	U	0.5	U	0.5	U	0.5	U
tert-BUTYL METHYL ETHER	ug/L	0.5	U	0.5	U	0.5	U	0.5	U
1,1,1-TRICHLOROETHANE	ug/L	0.5	U	0.5	U	0.5	U	0.5	U
1,1,2-TRICHLOROETHANE	ug/L	0.5	U	0.5	U	0.5	U	0.5	U
1,2,3-TRICHLOROBENZENE	ug/L	0.5	U	0.5	U	0.5	U	0.5	U
1,2,4-TRICHLOROBENZENE	ug/L	0.5	U	0.5	U	0.5	U	0.5	U
TRICHLOROETHYLENE (TCE)	ug/L	0.5	U	0.5	U	0.5	U	0.5	U
CHLOROFORM	ug/L	0.5	U	0.5	U	0.53	=	0.5	U
VINYL CHLORIDE	ug/L	0.5	U	0.5	U	0.5	U	0.5	U
XYLENES, TOTAL	ug/L	2	U	2	U	2	U	2	U
M,P-XYLENE (SUM OF ISOMERS)	ug/L								
O-XYLENE (1,2-DIMETHYLBENZENE)	ug/L								

Analytical Data Summary

	StationID	NDW06MW08	
	SampleID	NDW06GW08-R01	
	Date Collected	09/07/03	
	SampleType	N	
Parameter	Units		
METHYL ISOBUTYL KETONE (4-METHY	ug/L	5	U
METHYLENE CHLORIDE	ug/L	0.5	U
1,1,2,2-TETRACHLOROETHANE	ug/L	0.5	U
TETRACHLOROETHYLENE(PCE)	ug/L	0.5	U
STYRENE	ug/L	0.5	U
BROMOFORM	ug/L	0.5	U
tert-BUTYL METHYL ETHER	ug/L	0.5	U
1,1,1-TRICHLOROETHANE	ug/L	0.5	U
1,1,2-TRICHLOROETHANE	ug/L	0.5	U
1,2,3-TRICHLOROBENZENE	ug/L	0.5	U
1,2,4-TRICHLOROBENZENE	ug/L	0.5	U
TRICHLOROETHYLENE (TCE)	ug/L	0.5	U
CHLOROFORM	ug/L	0.5	U
VINYL CHLORIDE	ug/L	0.5	U
XYLENES, TOTAL	ug/L	2	U
M,P-XYLENE (SUM OF ISOMERS)	ug/L		
O-XYLENE (1,2-DIMETHYLBENZENE)	ug/L		

Analytical Data Summary

StationID		NDW06MW01		NDW06MW01		NDW06MW01		NDW06MW01	
SampleID		NDW6MW1-04		NDW6MW1-04		NDW6FDMW1-04		NDW6FDMW1-04	
Date Collected		02/11/04		02/11/04		02/11/04		02/11/04	
SampleType		N		N		FD		FD	
Analytical Method		E314.0		SW8321A		E314.0		SW8321A	
Parameter	**Units**								
Perchlorate	ug/L	20	U	2	U	20	U	2	U

Surface Water

Analytical Data Summary

	StationID	NDW06SW06		NDW06SW07		NDW06SW10		NDW06SW11	
	SampleID	NDW06SW06-R01		NDW06SW07-R01		NDW06SW10K-R01		NDW06SW11K-R01	
	Date Collected	09/29/03		09/29/03		09/29/03		09/29/03	
	SampleType	N		N		N		N	
Parameter	Units								
Alkalinity, bicarbonate (as caco3)	mg/L	108	=	112	=	173	=	176	=
Alkalinity, carbonate (as caco3)	mg/L	0.5	U	0.5	U	0.5	U	0.5	U
Alkalinity, hydroxide (as caco3)	mg/L	0.5	U	0.5	U	0.5	U	0.5	U

Analytical Data Summary

	StationID	NDW06SW02		NDW06SW02		NDW06SW03		NDW06SW05	
	SampleID	NDW06FD02P-R01		NDW06SW02-R01		NDW06SW03-R01		NDW06SW05-R01	
	Date Collected	10/01/03		10/01/03		10/01/03		10/01/03	
	SampleType	FD		N		N		N	
Parameter	Units								
Alkalinity, bicarbonate (as caco3)	mg/L	125	=	127	=	117	=	117	=
Alkalinity, carbonate (as caco3)	mg/L	0.5	U	0.5	U	0.5	U	0.5	U
Alkalinity, hydroxide (as caco3)	mg/L	0.5	U	0.5	U	0.5	U	0.5	U

Analytical Data Summary

	StationID	NDW06SW08		NDW06SW09	
	SampleID	NDW06SW08-R01		NDW06SW09-R01	
	Date Collected	10/01/03		10/01/03	
	SampleType	N		N	
Parameter	Units				
Alkalinity, bicarbonate (as caco3)	mg/L	140	=	115	=
Alkalinity, carbonate (as caco3)	mg/L	0.5	U	0.5	U
Alkalinity, hydroxide (as caco3)	mg/L	0.5	U	0.5	U

Analytical Data Summary

	StationID	NDW06SW06		NDW06SW07		NDW06SW10		NDW06SW11	
	SampleID	NDW06SW06-R01		NDW06SW07-R01		NDW06SW10K-R01		NDW06SW11K-R01	
	Date Collected	09/29/03		09/29/03		09/29/03		09/29/03	
	SampleType	N		N		N		N	
Parameter	Units								
Alkalinity, bicarbonate (as caco3)	mg/L	114	=	113	=	183	=	182	=
Alkalinity, carbonate (as caco3)	mg/L	0.5	U	0.5	U	0.5	U	0.5	U
Alkalinity, hydroxide (as caco3)	mg/L	0.5	U	0.5	U	0.5	U	0.5	U

Analytical Data Summary

	StationID	NDW06SW02		NDW06SW02		NDW06SW03		NDW06SW05	
	SampleID	NDW06FD02P-R01		NDW06SW02-R01		NDW06SW03-R01		NDW06SW05-R01	
	Date Collected	10/01/03		10/01/03		10/01/03		10/01/03	
	SampleType	FD		N		N		N	
Parameter	Units								
Alkalinity, bicarbonate (as caco3)	mg/L	127	=	125	=	119	=	115	=
Alkalinity, carbonate (as caco3)	mg/L	0.5	U	0.5	U	0.5	U	0.5	U
Alkalinity, hydroxide (as caco3)	mg/L	0.5	U	0.5	U	0.5	U	0.5	U

Analytical Data Summary

	StationID	NDW06SW08		NDW06SW09	
	SampleID	NDW06SW08-R01		NDW06SW09-R01	
	Date Collected	10/01/03		10/01/03	
	SampleType	N		N	
Parameter	Units				
Alkalinity, bicarbonate (as caco3)	mg/L	142	=	113	=
Alkalinity, carbonate (as caco3)	mg/L	0.5	U	0.5	U
Alkalinity, hydroxide (as caco3)	mg/L	0.5	U	0.5	U

Analytical Data Summary

	StationID	NDW06SW06		NDW06SW07		NDW06SW10		NDW06SW11	
	SampleID	NDW06SW06-R01		NDW06SW07-R01		NDW06SW10K-R01		NDW06SW11K-R01	
	Date Collected	09/29/03		09/29/03		09/29/03		09/29/03	
	SampleType	N		N		N		N	
Parameter	Units								
Chloride (as Cl)	mg/L	21300	=	21800	=	24600	=	24300	=
Nitrogen, nitrate (as n)	mg/L	0.0244	J	0.0201	UJ	0.0201	U	0.0201	U
Nitrogen, nitrite	mg/L	0.0253	J	0.0271	J	0.0301	J	0.0309	J
Phosphorus, total orthophosphate (as p)	mg/L	0.014	U	0.014	U	0.019	J	0.014	U
Sulfate (as SO4)	mg/L	2490	=	2370	=	2890	=	3050	=

Analytical Data Summary

	StationID	NDW06SW02		NDW06SW02		NDW06SW03		NDW06SW05	
	SampleID	NDW06FD02P-R01		NDW06SW02-R01		NDW06SW03-R01		NDW06SW05-R01	
	Date Collected	10/01/03		10/01/03		10/01/03		10/01/03	
	SampleType	FD		N		N		N	
Parameter	Units								
Chloride (as Cl)	mg/L	21900	=	22800	=	21800	=	21600	=
Nitrogen, nitrate (as n)	mg/L	0.0696	J	0.0201	U	0.0216	J	0.0242	J
Nitrogen, nitrite	mg/L	0.0118	U	0.0239	J	0.0262	J	0.0263	J
Phosphorus, total orthophosphate (as p)	mg/L	0.014	U	0.016	J	0.014	U	0.014	U
Sulfate (as SO4)	mg/L	2720	=	2280	=	2170	=	2530	=

Analytical Data Summary

	StationID	NDW06SW08		NDW06SW09	
	SampleID	NDW06SW08-R01		NDW06SW09-R01	
	Date Collected	10/01/03		10/01/03	
	SampleType	N		N	
Parameter	Units				
Chloride (as Cl)	mg/L	21900	=	21600	=
Nitrogen, nitrate (as n)	mg/L	0.0201	U	0.0201	U
Nitrogen, nitrite	mg/L	0.0251	J	0.0245	J
Phosphorus, total orthophosphate (as p)	mg/L	0.014	U	0.014	U
Sulfate (as SO4)	mg/L	2240	=	2470	=

Analytical Data Summary

	StationID	NDW06SW06		NDW06SW07		NDW06SW10		NDW06SW11	
	SampleID	NDW06SW06-R01		NDW06SW07-R01		NDW06SW10K-R01		NDW06SW11K-R01	
	Date Collected	09/29/03		09/29/03		09/29/03		09/29/03	
	SampleType	N		N		N		N	
Parameter	Units								
Chloride (as Cl)	mg/L	21400	=	21800	=	24700	=	24200	=
Nitrogen, nitrate (as n)	mg/L	0.0201	UJ	0.0201	UJ	0.0201	UJ	0.0201	UJ
Nitrogen, nitrite	mg/L	0.0245	J	0.0245	J	0.028	J	0.0274	J
Phosphorus, total orthophosphate (as p)	mg/L	0.022	J	0.02	J	0.014	U	0.014	U
Sulfate (as SO4)	mg/L	2640	=	2840	=	3040	=	2840	=

Analytical Data Summary

	StationID	NDW06SW02		NDW06SW02		NDW06SW03		NDW06SW05	
	SampleID	NDW06FD02P-R01		NDW06SW02-R01		NDW06SW03-R01		NDW06SW05-R01	
	Date Collected	10/01/03		10/01/03		10/01/03		10/01/03	
	SampleType	FD		N		N		N	
Parameter	Units								
Chloride (as Cl)	mg/L	21900	=	22100	=	21900	=	22200	=
Nitrogen, nitrate (as n)	mg/L	0.0201	U	0.0201	U	0.0201	U	0.0201	U
Nitrogen, nitrite	mg/L	0.0268	J	0.0235	J	0.0249	J	0.0252	J
Phosphorus, total orthophosphate (as p)	mg/L	0.014	U	0.048	J	0.044	J	0.033	J
Sulfate (as SO4)	mg/L	2720	=	2780	=	2750	=	2710	=

Analytical Data Summary

	StationID	NDW06SW08		NDW06SW09	
	SampleID	NDW06SW08-R01		NDW06SW09-R01	
	Date Collected	10/01/03		10/01/03	
	SampleType	N		N	
Parameter	Units				
Chloride (as Cl)	mg/L	21900	=	21700	=
Nitrogen, nitrate (as n)	mg/L	0.0201	U	0.0201	U
Nitrogen, nitrite	mg/L	0.0252	J	0.024	J
Phosphorus, total orthophosphate (as p)	mg/L	0.014	U	0.014	U
Sulfate (as SO4)	mg/L	2740	=	2670	=

Analytical Data Summary

	StationID	W6-SW01		W6-SW02		W6-SW03		W6-SW03	
	SampleID	NDA035		NDA036		NDA037		NDA038FD1	
	Date Collected	04/13/00		04/13/00		04/13/00		04/13/00	
	SampleType	N		N		N		FD	
Parameter	Units								
1,3-Dinitrobenzene	ug/L	5	U	5	U	5	UJ	5	U
2,4-Dinitrotoluene	ug/L	5	U	5	U	5	UJ	5	U
2,6-Dinitrotoluene	ug/L	5	U	5	U	5	UJ	5	U
Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine	ug/L	5	UJ	5	UJ	5	UJ	5	UJ
2-Nitrotoluene	ug/L	5	U	5	U	5	UJ	5	U
3-Nitrotoluene	ug/L	5	U	5	U	5	UJ	5	U
4-Nitrotoluene	ug/L	5	U	5	U	5	UJ	5	U
Nitrobenzene	ug/L	5	U	5	U	5	UJ	5	U
Hexahydro-1,3,5-trinitro-1,3,5,7-tetrazocine	ug/L	5	U	5	U	5	UJ	5	U
Tetryl	ug/L	5	U	5	U	5	UJ	5	U
1,3,5-Trinitrobenzene	ug/L	5	U	5	U	5	UJ	5	U
2,4,6-trinitrotoluene	ug/L	5	U	5	U	5	UJ	5	U

Analytical Data Summary

	StationID	W6-SW04		W6-SW05		W6-SW06		W6-SW07	
	SampleID	NDA039		NDA040		NDA300		NDA301	
	Date Collected	04/13/00		04/13/00		04/13/00		04/13/00	
	SampleType	N		N		N		N	
Parameter	Units								
1,3-Dinitrobenzene	ug/L	5	UJ	5	U	5	UJ	5	U
2,4-Dinitrotoluene	ug/L	5	UJ	5	U	5	UJ	5	U
2,6-Dinitrotoluene	ug/L	5	UJ	5	U	5	UJ	5	U
Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine	ug/L	5	UJ	5	UJ	5	UJ	5	UJ
2-Nitrotoluene	ug/L	5	UJ	5	U	5	UJ	5	U
3-Nitrotoluene	ug/L	5	UJ	5	U	5	UJ	5	U
4-Nitrotoluene	ug/L	5	UJ	5	U	5	UJ	5	U
Nitrobenzene	ug/L	5	UJ	5	U	5	UJ	5	U
Hexahydro-1,3,5-trinitro-1,3,5,7-tetrazocine	ug/L	5	UJ	5	U	5	UJ	5	U
Tetryl	ug/L	5	UJ	5	U	5	UJ	5	U
1,3,5-Trinitrobenzene	ug/L	5	UJ	5	U	5	UJ	5	U
2,4,6-trinitrotoluene	ug/L	5	UJ	5	U	5	UJ	5	U

Analytical Data Summary

	StationID	NDW06SW06		NDW06SW07		NDW06SW10		NDW06SW11	
	SampleID	NDW06SW06-R01		NDW06SW07-R01		NDW06SW10K-R01		NDW06SW11K-R01	
	Date Collected	09/29/03		09/29/03		09/29/03		09/29/03	
	SampleType	N		N		N		N	
Parameter	Units								
1,3-Dinitrobenzene	ug/L	2.5	U	2.5	U	2.5	U	2.5	U
2,4-Dinitrotoluene	ug/L	2.5	U	2.5	U	2.5	U	2.5	U
2,6-Dinitrotoluene	ug/L	2.5	U	2.5	U	2.5	U	2.5	U
Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine	ug/L	2.5	U	2.5	U	2.5	U	2.5	U
2-Nitrotoluene	ug/L	2.5	U	2.5	U	2.5	U	2.5	U
3-Nitrotoluene	ug/L	2.5	U	2.5	U	2.5	U	2.5	U
4-Nitrotoluene	ug/L	2.5	U	2.5	U	2.5	U	2.5	U
Nitrobenzene	ug/L	2.5	U	2.5	U	2.5	U	2.5	U
Hexahydro-1,3,5-trinitro-1,3,5,7-tetrazocine	ug/L	2.5	U	2.5	U	2.5	U	2.5	U
Tetryl	ug/L	2.5	U	2.5	U	2.5	U	2.5	U
1,3,5-Trinitrobenzene	ug/L	2.5	U	2.5	U	2.5	U	2.5	U
2,4,6-trinitrotoluene	ug/L	2.5	U	2.5	U	2.5	U	2.5	U

Analytical Data Summary

	StationID	NDW06SW02		NDW06SW02		NDW06SW03		NDW06SW05	
	SampleID	NDW06FD02P-R01		NDW06SW02-R01		NDW06SW03-R01		NDW06SW05-R01	
	Date Collected	10/01/03		10/01/03		10/01/03		10/01/03	
	SampleType	FD		N		N		N	
Parameter	Units								
1,3-Dinitrobenzene	ug/L	2.5	U	2.5	U	2.5	U	2.5	U
2,4-Dinitrotoluene	ug/L	2.5	U	2.5	U	2.5	U	2.5	U
2,6-Dinitrotoluene	ug/L	2.5	U	2.5	U	2.5	U	2.5	U
Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine	ug/L	2.5	U	2.5	U	2.5	U	2.5	U
2-Nitrotoluene	ug/L	2.5	U	2.5	U	2.5	U	2.5	U
3-Nitrotoluene	ug/L	2.5	U	2.5	U	2.5	U	2.5	U
4-Nitrotoluene	ug/L	2.5	U	2.5	U	2.5	U	2.5	U
Nitrobenzene	ug/L	2.5	U	2.5	U	2.5	U	2.5	U
Hexahydro-1,3,5-trinitro-1,3,5,7-tetrazocine	ug/L	2.5	U	2.5	U	2.5	U	2.5	U
Tetryl	ug/L	2.5	U	2.5	U	2.5	U	2.5	U
1,3,5-Trinitrobenzene	ug/L	2.5	U	2.5	U	2.5	U	2.5	U
2,4,6-trinitrotoluene	ug/L	2.5	U	2.5	U	2.5	U	2.5	U

Analytical Data Summary

	StationID	NDW06SW08		NDW06SW09	
	SampleID	NDW06SW08-R01		NDW06SW09-R01	
	Date Collected	10/01/03		10/01/03	
	SampleType	N		N	
Parameter	Units				
1,3-Dinitrobenzene	ug/L	2.5	U	2.5	U
2,4-Dinitrotoluene	ug/L	2.5	U	2.5	U
2,6-Dinitrotoluene	ug/L	2.5	U	2.5	U
Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine	ug/L	2.5	U	2.5	U
2-Nitrotoluene	ug/L	2.5	U	2.5	U
3-Nitrotoluene	ug/L	2.5	U	2.5	U
4-Nitrotoluene	ug/L	2.5	U	2.5	U
Nitrobenzene	ug/L	2.5	U	2.5	U
Hexahydro-1,3,5-trinitro-1,3,5,7-tetrazocine	ug/L	2.5	U	2.5	U
Tetryl	ug/L	2.5	U	2.5	U
1,3,5-Trinitrobenzene	ug/L	2.5	U	2.5	U
2,4,6-trinitrotoluene	ug/L	2.5	U	2.5	U

Analytical Data Summary

	StationID	NDW06SW06		NDW06SW07		NDW06SW10		NDW06SW11		NDW06SW02	
	SampleID	NDW06SW06-R01		NDW06SW07-R01		NDW06SW10K-R01		NDW06SW11K-R01		NDW06FD02P-R01	
	Date Collected	09/29/03		09/29/03		09/29/03		09/29/03		10/01/03	
	SampleType	N		N		N		N		FD	
Parameter	Units										
Aluminum, dissolved	ug/L	700	U	700	U	700	U	700	U	700	U
Antimony, dissolved	ug/L	50	U	50	U	50	U	50	U	50	U
Arsenic, dissolved	ug/L	40.8	U	40.8	U	40.8	U	40.8	U	40.8	U
Barium, dissolved	ug/L	9.82	U	9.82	U	13.6	J	11	J	9.82	U
Beryllium, dissolved	ug/L	1.89	U	1.89	U	1.89	U	1.89	U	1.89	U
Cadmium, dissolved	ug/L	7.12	U	7.12	U	7.12	U	7.12	U	7.12	U
Calcium, dissolved	ug/L	409000	J	403000	J	482000	J	459000	J	408000	J
Chromium, dissolved	ug/L	11.4	U	11.4	U	11.4	U	11.4	U	11.4	U
Cobalt, dissolved	ug/L	11.4	U	11.4	U	11.4	U	11.4	U	11.4	U
Copper, dissolved	ug/L	23.4	U	23.4	U	23.4	U	23.4	U	23.4	U
Iron, dissolved	ug/L	334	UJ	334	UJ	334	UJ	334	UJ	334	UJ
Lead, dissolved	ug/L	35.2	U	35.2	U	35.2	U	35.2	U	35.2	U
Magnesium, dissolved	ug/L	1250000	J	1240000	J	1460000	J	1390000	J	1250000	J
Manganese, dissolved	ug/L	3.34	U	6.13	J	7	J	3.84	J	3.34	U
Mercury, dissolved	ug/L	0.032	J	0.0241	J	0.0561	J	0.056	J	0.0721	J
Nickel, dissolved	ug/L	19.9	U	19.9	U	19.9	U	19.9	U	19.9	U
Potassium, dissolved	ug/L	660000	J	648000	J	782000	J	750000	J	661000	J
Selenium, dissolved	ug/L	42	U	42	U	42	U	42	U	42	U
Silver, dissolved	ug/L	9.44	U	9.44	U	9.44	U	9.44	U	9.44	U
Sodium, dissolved	ug/L	10300000	J	10100000	J	12100000	J	11700000	J	10400000	J
Thallium, dissolved	ug/L	50.8	U	50.8	U	50.8	U	50.8	U	50.8	U
Vanadium, dissolved	ug/L	8.94	U	8.94	U	8.94	U	8.94	U	8.94	U
Zinc, dissolved	ug/L	8.18	U	8.18	U	8.18	U	8.18	U	8.18	U

Analytical Data Summary

	StationID	NDW06SW02		NDW06SW03		NDW06SW05		NDW06SW08		NDW06SW09	
	SampleID	NDW06SW02-R01		NDW06SW03-R01		NDW06SW05-R01		NDW06SW08-R01		NDW06SW09-R01	
	Date Collected	10/01/03		10/01/03		10/01/03		10/01/03		10/01/03	
	SampleType	N		N		N		N		N	
Parameter	Units										
Aluminum, dissolved	ug/L	700	U	700	U	700	U	700	U	700	U
Antimony, dissolved	ug/L	50	U	50	U	50	U	50	U	50	U
Arsenic, dissolved	ug/L	40.8	U	40.8	U	40.8	U	40.8	U	40.8	U
Barium, dissolved	ug/L	9.82	U	9.82	U	9.82	U	9.82	U	9.82	U
Beryllium, dissolved	ug/L	1.89	U	1.89	U	1.89	U	1.89	U	1.89	U
Cadmium, dissolved	ug/L	7.12	U	7.12	U	7.12	U	7.12	U	7.12	U
Calcium, dissolved	ug/L	419000	J	413000	J	403000	J	412000	J	397000	J
Chromium, dissolved	ug/L	11.4	U	11.4	U	11.4	U	11.4	U	11.4	U
Cobalt, dissolved	ug/L	11.4	U	11.4	U	11.4	U	11.4	U	11.4	U
Copper, dissolved	ug/L	23.4	U	23.4	U	23.4	U	23.4	U	23.4	U
Iron, dissolved	ug/L	334	UJ	334	UJ	334	UJ	334	UJ	334	UJ
Lead, dissolved	ug/L	35.2	U	35.2	U	35.2	U	35.2	U	35.2	U
Magnesium, dissolved	ug/L	1270000	J	1250000	J	1230000	J	1240000	J	1220000	J
Manganese, dissolved	ug/L	14.9	J	3.34	U	17.4	J	24.5	J	3.34	U
Mercury, dissolved	ug/L	0.0316	J	0.0256	J	0.0452	J	0.0242	J	0.0162	U
Nickel, dissolved	ug/L	52	J	19.9	U	19.9	U	19.9	U	19.9	U
Potassium, dissolved	ug/L	667000	J	663000	J	647000	J	652000	J	648000	J
Selenium, dissolved	ug/L	42	U	42	U	42	U	42	U	42	U
Silver, dissolved	ug/L	9.44	U	9.44	U	9.44	U	9.44	U	9.44	U
Sodium, dissolved	ug/L	10400000	J	10300000	J	10100000	J	10200000	J	10300000	J
Thallium, dissolved	ug/L	50.8	U	50.8	U	50.8	U	50.8	U	50.8	U
Vanadium, dissolved	ug/L	8.94	U	8.94	U	8.94	U	8.94	U	8.94	U
Zinc, dissolved	ug/L	8.18	U	8.18	U	8.18	U	8.18	U	8.18	U

Analytical Data Summary

	StationID	NDW06SW06		NDW06SW07		NDW06SW10		NDW06SW11	
	SampleID	NDW06SW06-R01		NDW06SW07-R01		NDW06SW10K-R01		NDW06SW11K-R01	
	Date Collected	09/29/03		09/29/03		09/29/03		09/29/03	
	SampleType	N		N		N		N	
Parameter	Units								
Aluminum, dissolved	ug/L	700	U	700	U	700	U	700	U
Antimony, dissolved	ug/L	50	U	50	U	50	U	50	U
Arsenic, dissolved	ug/L	40.8	U	40.8	U	40.8	U	40.8	U
Barium, dissolved	ug/L	9.82	U	9.82	U	13.6	J	11	J
Beryllium, dissolved	ug/L	1.89	U	1.89	U	1.89	U	1.89	U
Cadmium, dissolved	ug/L	7.12	U	7.12	U	7.12	U	7.12	U
Calcium, dissolved	ug/L	409000	J	403000	J	482000	J	459000	J
Chromium, dissolved	ug/L	11.4	U	11.4	U	11.4	U	11.4	U
Cobalt, dissolved	ug/L	11.4	U	11.4	U	11.4	U	11.4	U
Copper, dissolved	ug/L	23.4	U	23.4	U	23.4	U	23.4	U
Iron, dissolved	ug/L	334	UJ	334	UJ	334	UJ	334	UJ
Lead, dissolved	ug/L	35.2	U	35.2	U	35.2	U	35.2	U
Magnesium, dissolved	ug/L	1250000	J	1240000	J	1460000	J	1390000	J
Manganese, dissolved	ug/L	3.34	U	6.13	J	7	J	3.84	J
Mercury, dissolved	ug/L	0.032	J	0.0241	J	0.0561	J	0.056	J
Nickel, dissolved	ug/L	19.9	U	19.9	U	19.9	U	19.9	U
Potassium, dissolved	ug/L	660000	J	648000	J	782000	J	750000	J
Selenium, dissolved	ug/L	42	U	42	U	42	U	42	U
Silver, dissolved	ug/L	9.44	U	9.44	U	9.44	U	9.44	U
Sodium, dissolved	ug/L	10300000	J	10100000	J	12100000	J	11700000	J
Thallium, dissolved	ug/L	50.8	U	50.8	U	50.8	U	50.8	U
Vanadium, dissolved	ug/L	8.94	U	8.94	U	8.94	U	8.94	U
Zinc, dissolved	ug/L	8.18	U	8.18	U	8.18	U	8.18	U

Analytical Data Summary

	StationID	NDW06SW02		NDW06SW02		NDW06SW03		NDW06SW05		NDW06SW08	
	SampleID	NDW06FD02P-R01		NDW06SW02-R01		NDW06SW03-R01		NDW06SW05-R01		NDW06SW08-R01	
	Date Collected	10/01/03		10/01/03		10/01/03		10/01/03		10/01/03	
	SampleType	FD		N		N		N		N	
Parameter	Units										
Aluminum, dissolved	ug/L	700	U	700	U	700	U	700	U	700	U
Antimony, dissolved	ug/L	50	U	50	U	50	U	50	U	50	U
Arsenic, dissolved	ug/L	40.8	U	40.8	U	40.8	U	40.8	U	40.8	U
Barium, dissolved	ug/L	9.82	U	9.82	U	9.82	U	9.82	U	9.82	U
Beryllium, dissolved	ug/L	1.89	U	1.89	U	1.89	U	1.89	U	1.89	U
Cadmium, dissolved	ug/L	7.12	U	7.12	U	7.12	U	7.12	U	7.12	U
Calcium, dissolved	ug/L	408000	J	419000	J	413000	J	403000	J	412000	J
Chromium, dissolved	ug/L	11.4	U	11.4	U	11.4	U	11.4	U	11.4	U
Cobalt, dissolved	ug/L	11.4	U	11.4	U	11.4	U	11.4	U	11.4	U
Copper, dissolved	ug/L	23.4	U	23.4	U	23.4	U	23.4	U	23.4	U
Iron, dissolved	ug/L	334	UJ	334	UJ	334	UJ	334	UJ	334	UJ
Lead, dissolved	ug/L	35.2	U	35.2	U	35.2	U	35.2	U	35.2	U
Magnesium, dissolved	ug/L	1250000	J	1270000	J	1250000	J	1230000	J	1240000	J
Manganese, dissolved	ug/L	3.34	U	14.9	J	3.34	U	17.4	J	24.5	J
Mercury, dissolved	ug/L	0.0721	J	0.0316	J	0.0256	J	0.0452	J	0.0242	J
Nickel, dissolved	ug/L	19.9	U	52	J	19.9	U	19.9	U	19.9	U
Potassium, dissolved	ug/L	661000	J	667000	J	663000	J	647000	J	652000	J
Selenium, dissolved	ug/L	42	U	42	U	42	U	42	U	42	U
Silver, dissolved	ug/L	9.44	U	9.44	U	9.44	U	9.44	U	9.44	U
Sodium, dissolved	ug/L	10400000	J	10400000	J	10300000	J	10100000	J	10200000	J
Thallium, dissolved	ug/L	50.8	U	50.8	U	50.8	U	50.8	U	50.8	U
Vanadium, dissolved	ug/L	8.94	U	8.94	U	8.94	U	8.94	U	8.94	U
Zinc, dissolved	ug/L	8.18	U	8.18	U	8.18	U	8.18	U	8.18	U

Analytical Data Summary

	StationID	NDW06SW09	
	SampleID	NDW06SW09-R01	
	Date Collected	10/01/03	
	SampleType	N	
Parameter	Units		
Aluminum, dissolved	ug/L	700	U
Antimony, dissolved	ug/L	50	U
Arsenic, dissolved	ug/L	40.8	U
Barium, dissolved	ug/L	9.82	U
Beryllium, dissolved	ug/L	1.89	U
Cadmium, dissolved	ug/L	7.12	U
Calcium, dissolved	ug/L	397000	J
Chromium, dissolved	ug/L	11.4	U
Cobalt, dissolved	ug/L	11.4	U
Copper, dissolved	ug/L	23.4	U
Iron, dissolved	ug/L	334	UJ
Lead, dissolved	ug/L	35.2	U
Magnesium, dissolved	ug/L	1220000	J
Manganese, dissolved	ug/L	3.34	U
Mercury, dissolved	ug/L	0.0162	U
Nickel, dissolved	ug/L	19.9	U
Potassium, dissolved	ug/L	648000	J
Selenium, dissolved	ug/L	42	U
Silver, dissolved	ug/L	9.44	U
Sodium, dissolved	ug/L	10300000	J
Thallium, dissolved	ug/L	50.8	U
Vanadium, dissolved	ug/L	8.94	U
Zinc, dissolved	ug/L	8.18	U

Analytical Data Summary

	StationID	NDW06SW06		NDW06SW07		NDW06SW10		NDW06SW11		NDW06SW02	
	SampleID	NDW06SW06-R01		NDW06SW07-R01		NDW06SW10K-R01		NDW06SW11K-R01		NDW06FD02P-R01	
	Date Collected	09/29/03		09/29/03		09/29/03		09/29/03		10/01/03	
	SampleType	N		N		N		N		FD	
Parameter	Units										
Perchlorate	ug/L	1/20	U	1/20	U	1/20	U	1/20	U	1/20	U

Analytical Data Summary

	StationID	NDW06SW02		NDW06SW03		NDW06SW05		NDW06SW08		NDW06SW09	
	SampleID	NDW06SW02-R01		NDW06SW03-R01		NDW06SW05-R01		NDW06SW08-R01		NDW06SW09-R01	
	Date Collected	10/01/03		10/01/03		10/01/03		10/01/03		10/01/03	
	SampleType	N		N		N		N		N	
Parameter	Units										
Perchlorate	ug/L	1/20	U	1/20	U	1/20	U	1/20	U	1/20	U

Analytical Data Summary

	StationID	W6-SW01		W6-SW02		W6-SW03		W6-SW03		W6-SW04	
	SampleID	NDA035		NDA036		NDA037		NDA038FD1		NDA039	
	Date Collected	04/13/00		04/13/00		04/13/00		04/13/00		04/13/00	
	SampleType	N		N		N		FD		N	
Parameter	Units										
Aroclor-1016	ug/L	1.1	U	1	U	1.1	U	1.1	U	1	U
Aroclor-1221	ug/L	2.1	U	2.1	U	2.2	U	2.2	U	2.1	U
Aroclor-1232	ug/L	1.1	U	1	U	1.1	U	1.1	U	1	U
Aroclor-1242	ug/L	1.1	U	1	U	1.1	U	1.1	U	1	U
Aroclor-1248	ug/L	1.1	U	1	U	1.1	U	1.1	U	1	U
Aroclor-1254	ug/L	1.1	U	1	U	1.1	U	1.1	U	1	U
Aroclor-1260	ug/L	1.1	U	1	U	1.1	U	1.1	U	1	U

Analytical Data Summary

	StationID	W6-SW05		W6-SW06		W6-SW07		NDW06SW06		NDW06SW07	
	SampleID	NDA040		NDA300		NDA301		NDW06SW06-R01		NDW06SW07-R01	
	Date Collected	04/13/00		04/13/00		04/13/00		09/29/03		09/29/03	
	SampleType	N		N		N		N		N	
Parameter	Units										
Aroclor-1016	ug/L	1.1	U	1.1	U	1.1	U	0.99	U	1	U
Aroclor-1221	ug/L	2.2	U	2.2	U	2.3	U	0.2	U	0.21	U
Aroclor-1232	ug/L	1.1	U	1.1	U	1.1	U	0.4	U	0.41	U
Aroclor-1242	ug/L	1.1	U	1.1	U	1.1	U	0.2	U	0.21	U
Aroclor-1248	ug/L	1.1	U	1.1	U	1.1	U	0.2	U	0.21	U
Aroclor-1254	ug/L	1.1	U	1.1	U	1.1	U	0.2	U	0.21	U
Aroclor-1260	ug/L	1.1	U	1.1	U	1.1	U	0.2	U	0.21	U

Analytical Data Summary

	StationID	NDW06SW10		NDW06SW11		NDW06SW02		NDW06SW02		NDW06SW03	
	SampleID	NDW06SW10K-R01		NDW06SW11K-R01		NDW06FD02P-R01		NDW06SW02-R01		NDW06SW03-R01	
	Date Collected	09/29/03		09/29/03		10/01/03		10/01/03		10/01/03	
	SampleType	N		N		FD		N		N	
Parameter	Units										
Aroclor-1016	ug/L	0.99	U	1	U	1	U	1	U	1	U
Aroclor-1221	ug/L	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U
Aroclor-1232	ug/L	0.4	U	0.4	U	0.41	U	0.41	U	0.4	U
Aroclor-1242	ug/L	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U
Aroclor-1248	ug/L	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U
Aroclor-1254	ug/L	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U
Aroclor-1260	ug/L	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U

Analytical Data Summary

	StationID	NDW06SW05		NDW06SW08		NDW06SW09	
	SampleID	NDW06SW05-R01		NDW06SW08-R01		NDW06SW09-R01	
	Date Collected	10/01/03		10/01/03		10/01/03	
	SampleType	N		N		N	
Parameter	Units						
Aroclor-1016	ug/L	1	U	1	U	1	U
Aroclor-1221	ug/L	0.2	U	0.21	U	0.2	U
Aroclor-1232	ug/L	0.4	U	0.41	U	0.4	U
Aroclor-1242	ug/L	0.2	U	0.21	U	0.2	U
Aroclor-1248	ug/L	0.2	U	0.21	U	0.2	U
Aroclor-1254	ug/L	0.2	U	0.21	U	0.2	U
Aroclor-1260	ug/L	0.2	U	0.21	U	0.2	U

Analytical Data Summary

	StationID	W6-SW01		W6-SW02		W6-SW03		W6-SW03	
	SampleID	NDA035		NDA036		NDA037		NDA038FD1	
	Date Collected	04/13/00		04/13/00		04/13/00		04/13/00	
	SampleType	N		N		N		FD	
Parameter	Units								
Aldrin	ug/L	0.05	U	0.05	U	0.05	U	0.05	U
Alpha bhc (alpha hexachlorocyclohexane)	ug/L	0.05	U	0.05	U	0.05	U	0.05	U
Beta bhc (beta hexachlorocyclohexane)	ug/L	0.05	U	0.05	U	0.05	U	0.05	U
Delta bhc (delta hexachlorocyclohexane)	ug/L	0.05	U	0.05	U	0.05	U	0.05	U
Gamma bhc (lindane)	ug/L	0.05	U	0.05	U	0.05	U	0.05	U
Alpha-chlordane	ug/L	0.05	U	0.05	U	0.05	U	0.05	U
Gamma-chlordane	ug/L	0.05	U	0.05	U	0.05	U	0.05	U
p,p'-DDD	ug/L	0.11	U	0.1	U	0.11	U	0.11	U
p,p'-DDE	ug/L	0.11	U	0.1	U	0.11	U	0.11	U
p,p'-DDT	ug/L	0.11	U	0.1	U	0.11	U	0.11	U
Dieldrin	ug/L	0.11	U	0.1	U	0.11	U	0.11	U
Alpha endosulfan	ug/L	0.05	U	0.05	U	0.05	U	0.05	U
Beta endosulfan	ug/L	0.11	U	0.1	U	0.11	U	0.11	U
Endosulfan sulfate	ug/L	0.11	U	0.1	U	0.11	U	0.11	U
Endrin	ug/L	0.11	U	0.1	U	0.11	U	0.11	U
Endrin aldehyde	ug/L	0.11	U	0.1	U	0.11	U	0.11	U
Endrin ketone	ug/L	0.11	U	0.1	U	0.11	U	0.11	U
Heptachlor epoxide	ug/L	0.05	U	0.05	U	0.05	U	0.05	U
Heptachlor	ug/L	0.05	U	0.05	U	0.05	U	0.05	U
Methoxychlor	ug/L	0.53	U	0.52	U	0.54	U	0.54	U
Toxaphene	ug/L	5.3	U	5.2	U	5.4	U	5.4	U

Analytical Data Summary

	StationID	W6-SW04		W6-SW05		W6-SW06		W6-SW07	
	SampleID	NDA039		NDA040		NDA300		NDA301	
	Date Collected	04/13/00		04/13/00		04/13/00		04/13/00	
	SampleType	N		N		N		N	
Parameter	Units								
Aldrin	ug/L	0.05	U	0.06	U	0.05	U	0.06	U
Alpha bhc (alpha hexachlorocyclohexane)	ug/L	0.05	U	0.06	U	0.05	U	0.06	U
Beta bhc (beta hexachlorocyclohexane)	ug/L	0.05	U	0.06	U	0.05	U	0.06	U
Delta bhc (delta hexachlorocyclohexane)	ug/L	0.05	U	0.06	U	0.05	U	0.06	U
Gamma bhc (lindane)	ug/L	0.05	U	0.06	U	0.05	U	0.06	U
Alpha-chlordane	ug/L	0.05	U	0.06	U	0.05	U	0.06	U
Gamma-chlordane	ug/L	0.05	U	0.06	U	0.05	U	0.06	U
p,p'-DDD	ug/L	0.1	U	0.11	U	0.11	U	0.11	U
p,p'-DDE	ug/L	0.1	U	0.11	U	0.11	U	0.11	U
p,p'-DDT	ug/L	0.1	U	0.11	U	0.11	U	0.11	U
Dieldrin	ug/L	0.1	U	0.11	U	0.11	U	0.11	U
Alpha endosulfan	ug/L	0.05	U	0.06	U	0.05	U	0.06	U
Beta endosulfan	ug/L	0.1	U	0.11	U	0.11	U	0.11	U
Endosulfan sulfate	ug/L	0.1	U	0.11	U	0.11	U	0.11	U
Endrin	ug/L	0.1	U	0.11	U	0.11	U	0.11	U
Endrin aldehyde	ug/L	0.1	U	0.11	U	0.11	U	0.11	U
Endrin ketone	ug/L	0.1	U	0.11	U	0.11	U	0.11	U
Heptachlor epoxide	ug/L	0.05	U	0.06	U	0.05	U	0.06	U
Heptachlor	ug/L	0.05	U	0.06	U	0.05	U	0.06	U
Methoxychlor	ug/L	0.52	U	0.56	U	0.54	U	0.57	U
Toxaphene	ug/L	5.2	U	5.6	U	5.4	U	5.7	U

Analytical Data Summary

	StationID	NDW06SW06		NDW06SW07		NDW06SW10		NDW06SW11	
	SampleID	NDW06SW06-R01		NDW06SW07-R01		NDW06SW10K-R01		NDW06SW11K-R01	
	Date Collected	09/29/03		09/29/03		09/29/03		09/29/03	
	SampleType	N		N		N		N	
Parameter	Units								
Aldrin	ug/L	0.0099	U	0.01	U	0.0099	U	0.01	U
Alpha bhc (alpha hexachlorocyclohexane)	ug/L	0.0099	UJ	0.01	UJ	0.0099	UJ	0.01	UJ
Beta bhc (beta hexachlorocyclohexane)	ug/L	0.0099	U	0.01	U	0.0099	U	0.01	U
Delta bhc (delta hexachlorocyclohexane)	ug/L	0.0099	U	0.01	U	0.0099	U	0.01	U
Gamma bhc (lindane)	ug/L	0.0099	UJ	0.01	UJ	0.0099	UJ	0.01	UJ
Alpha-chlordane	ug/L	0.0099	U	0.01	U	0.0099	U	0.01	U
Gamma-chlordane	ug/L	0.0099	U	0.01	U	0.0099	U	0.01	U
p,p'-DDD	ug/L	0.02	U	0.021	U	0.02	U	0.02	U
p,p'-DDE	ug/L	0.02	U	0.021	U	0.02	U	0.02	U
p,p'-DDT	ug/L	0.02	U	0.021	U	0.02	U	0.02	U
Dieldrin	ug/L	0.02	U	0.021	U	0.02	U	0.02	U
Alpha endosulfan	ug/L	0.0099	U	0.01	U	0.0099	U	0.01	U
Beta endosulfan	ug/L	0.02	U	0.021	U	0.02	U	0.02	U
Endosulfan sulfate	ug/L	0.02	U	0.021	U	0.02	U	0.02	U
Endrin	ug/L	0.02	U	0.021	U	0.02	U	0.02	U
Endrin aldehyde	ug/L	0.02	U	0.021	U	0.02	U	0.02	U
Endrin ketone	ug/L	0.02	U	0.021	U	0.02	U	0.02	U
Heptachlor epoxide	ug/L	0.0099	U	0.01	U	0.0099	U	0.01	U
Heptachlor	ug/L	0.0099	U	0.01	U	0.0099	U	0.01	U
Methoxychlor	ug/L	0.099	U	0.1	U	0.099	U	0.1	U
Toxaphene	ug/L	0.05	U	0.052	U	0.05	U	0.05	U

Analytical Data Summary

	StationID	NDW06SW02		NDW06SW02		NDW06SW03		NDW06SW05	
	SampleID	NDW06FD02P-R01		NDW06SW02-R01		NDW06SW03-R01		NDW06SW05-R01	
	Date Collected	10/01/03		10/01/03		10/01/03		10/01/03	
	SampleType	FD		N		N		N	
Parameter	Units								
Aldrin	ug/L	0.01	U	0.01	UJ	0.01	U	0.01	U
Alpha bhc (alpha hexachlorocyclohexane)	ug/L	0.01	UJ	0.01	UJ	0.01	UJ	0.01	UJ
Beta bhc (beta hexachlorocyclohexane)	ug/L	0.01	U	0.01	UJ	0.01	U	0.01	U
Delta bhc (delta hexachlorocyclohexane)	ug/L	0.01	U	0.01	UJ	0.01	U	0.01	U
Gamma bhc (lindane)	ug/L	0.01	UJ	0.01	UJ	0.01	UJ	0.01	UJ
Alpha-chlordane	ug/L	0.01	U	0.01	UJ	0.01	U	0.01	U
Gamma-chlordane	ug/L	0.01	U	0.01	UJ	0.01	U	0.01	U
p,p'-DDD	ug/L	0.02	U	0.02	UJ	0.02	U	0.02	U
p,p'-DDE	ug/L	0.02	U	0.02	UJ	0.02	U	0.02	U
p,p'-DDT	ug/L	0.02	U	0.02	UJ	0.02	U	0.02	U
Dieldrin	ug/L	0.02	U	0.02	UJ	0.02	U	0.02	U
Alpha endosulfan	ug/L	0.01	U	0.01	UJ	0.01	U	0.01	U
Beta endosulfan	ug/L	0.02	U	0.02	UJ	0.02	U	0.02	U
Endosulfan sulfate	ug/L	0.02	U	0.02	UJ	0.02	U	0.02	U
Endrin	ug/L	0.02	U	0.02	UJ	0.02	U	0.02	U
Endrin aldehyde	ug/L	0.02	U	0.02	UJ	0.02	U	0.02	U
Endrin ketone	ug/L	0.02	U	0.02	UJ	0.02	U	0.02	U
Heptachlor epoxide	ug/L	0.01	U	0.01	UJ	0.01	U	0.01	U
Heptachlor	ug/L	0.01	U	0.01	UJ	0.01	U	0.01	U
Methoxychlor	ug/L	0.1	U	0.1	UJ	0.1	U	0.1	U
Toxaphene	ug/L	0.051	U	0.051	UJ	0.05	U	0.05	U

Analytical Data Summary

	StationID	NDW06SW08		NDW06SW09	
	SampleID	NDW06SW08-R01		NDW06SW09-R01	
	Date Collected	10/01/03		10/01/03	
	SampleType	N		N	
Parameter	Units				
Aldrin	ug/L	0.01	UJ	0.01	U
Alpha bhc (alpha hexachlorocyclohexane)	ug/L	0.01	UJ	0.01	UJ
Beta bhc (beta hexachlorocyclohexane)	ug/L	0.01	U	0.01	U
Delta bhc (delta hexachlorocyclohexane)	ug/L	0.01	U	0.01	U
Gamma bhc (lindane)	ug/L	0.01	UJ	0.01	UJ
Alpha-chlordane	ug/L	0.01	U	0.01	U
Gamma-chlordane	ug/L	0.01	U	0.01	U
p,p'-DDD	ug/L	0.021	U	0.02	U
p,p'-DDE	ug/L	0.021	U	0.02	U
p,p'-DDT	ug/L	0.021	UJ	0.02	U
Dieldrin	ug/L	0.021	U	0.02	U
Alpha endosulfan	ug/L	0.01	U	0.01	U
Beta endosulfan	ug/L	0.021	U	0.02	U
Endosulfan sulfate	ug/L	0.021	U	0.02	U
Endrin	ug/L	0.021	UJ	0.02	U
Endrin aldehyde	ug/L	0.021	U	0.02	U
Endrin ketone	ug/L	0.021	U	0.02	U
Heptachlor epoxide	ug/L	0.01	U	0.01	U
Heptachlor	ug/L	0.01	UJ	0.01	U
Methoxychlor	ug/L	0.1	U	0.1	U
Toxaphene	ug/L	0.052	U	0.05	U

Analytical Data Summary

	StationID	W6-SW01		W6-SW02		W6-SW03		W6-SW03	
	SampleID	NDA035		NDA036		NDA037		NDA038FD1	
	Date Collected	04/13/00		04/13/00		04/13/00		04/13/00	
	SampleType	N		N		N		FD	
Parameter	Units								
1,2,4,5-TETRACHLOROBENZENE	ug/L								
1,2,4-TRICHLOROBENZENE	ug/L	10	U	10	U	10	U	10	U
1,2-DICHLOROBENZENE	ug/L	10	U	10	U	10	U	10	U
1,3-DICHLOROBENZENE	ug/L	10	U	10	U	10	U	10	U
1,4-DICHLOROBENZENE	ug/L	10	U	10	U	10	U	10	U
2,4,5-TRICHLOROPHENOL	ug/L	52	U	51	U	51	U	52	U
2,4,6-TRICHLOROPHENOL	ug/L	10	U	10	U	10	U	10	U
2,4-DICHLOROPHENOL	ug/L	10	U	10	U	10	U	10	U
2,4-DIMETHYLPHENOL	ug/L	10	U	10	U	10	U	10	U
2,4-DINITROPHENOL	ug/L	52	U	51	U	51	U	52	U
2,4-DINITROTOLUENE	ug/L	10	U	10	U	10	U	10	U
2,6-DINITROTOLUENE	ug/L	10	U	10	U	10	U	10	U
2-CHLORONAPHTHALENE	ug/L	10	U	10	U	10	U	10	U
2-CHLOROPHENOL	ug/L	10	U	10	U	10	U	10	U
2-METHYLNAPHTHALENE	ug/L	10	U	10	U	10	U	10	U
2-METHYLPHENOL (o-CRESOL)	ug/L	10	U	10	U	10	U	10	U
2-NITROANILINE	ug/L	52	U	51	U	51	U	52	U
2-NITROPHENOL	ug/L	10	U	10	U	10	U	10	U
3,3'-DICHLOROBENZIDINE	ug/L	21	U	20	U	20	U	21	U
3-NITROANILINE	ug/L	52	U	51	U	51	U	52	U
4,6-DINITRO-2-METHYLPHENOL	ug/L	52	U	51	U	51	U	52	U
4-BROMOPHENYL PHENYL ETHER	ug/L	10	U	10	U	10	U	10	U
4-CHLORO-3-METHYLPHENOL	ug/L	10	U	10	U	10	U	10	U
4-CHLOROANILINE	ug/L	10	U	10	U	10	U	10	U
4-CHLOROPHENYL PHENYL ETHE	ug/L	10	U	10	U	10	U	10	U
4-METHYLPHENOL (p-CRESOL)	ug/L								
4-NITROANILINE	ug/L	52	U	51	U	51	U	52	U
4-NITROPHENOL	ug/L	52	U	51	U	51	U	52	U
ACENAPHTHENE	ug/L	10	U	10	U	10	U	10	U
ACENAPHTHYLENE	ug/L	10	U	10	U	10	U	10	U
ACETOPHENONE	ug/L								
ANTHRACENE	ug/L	10	U	10	U	10	U	10	U
ATRAZINE	ug/L								
BENZALDEHYDE	ug/L								
BENZO(a)ANTHRACENE	ug/L	10	U	10	U	10	U	10	U
BENZO(a)PYRENE	ug/L	10	U	10	U	10	U	10	U
BENZO(b)FLUORANTHENE	ug/L	10	U	10	U	10	U	10	U

Analytical Data Summary

	StationID	W6-SW04		W6-SW05		W6-SW06		W6-SW07	
	SampleID	NDA039		NDA040		NDA300		NDA301	
	Date Collected	04/13/00		04/13/00		04/13/00		04/13/00	
	SampleType	N		N		N		N	
Parameter	Units								
1,2,4,5-TETRACHLOROBENZENE	ug/L								
1,2,4-TRICHLOROBENZENE	ug/L	10	U	11	U	10	U	11	U
1,2-DICHLOROBENZENE	ug/L	10	U	11	U	10	U	11	U
1,3-DICHLOROBENZENE	ug/L	10	U	11	U	10	U	11	U
1,4-DICHLOROBENZENE	ug/L	10	U	11	U	10	U	11	U
2,4,5-TRICHLOROPHENOL	ug/L	52	U	53	U	51	U	54	U
2,4,6-TRICHLOROPHENOL	ug/L	10	U	11	U	10	U	11	U
2,4-DICHLOROPHENOL	ug/L	10	U	11	U	10	U	11	U
2,4-DIMETHYLPHENOL	ug/L	10	U	11	U	10	U	11	U
2,4-DINITROPHENOL	ug/L	52	U	53	U	51	U	54	U
2,4-DINITROTOLUENE	ug/L	10	U	11	U	10	U	11	U
2,6-DINITROTOLUENE	ug/L	10	U	11	U	10	U	11	U
2-CHLORONAPHTHALENE	ug/L	10	U	11	U	10	U	11	U
2-CHLOROPHENOL	ug/L	10	U	11	U	10	U	11	U
2-METHYLNAPHTHALENE	ug/L	10	U	11	U	10	U	11	U
2-METHYLPHENOL (o-CRESOL)	ug/L	10	U	11	U	10	U	11	U
2-NITROANILINE	ug/L	52	U	53	U	51	U	54	U
2-NITROPHENOL	ug/L	10	U	11	U	10	U	11	U
3,3'-DICHLOROBENZIDINE	ug/L	21	U	21	U	20	U	22	U
3-NITROANILINE	ug/L	52	U	53	U	51	U	54	U
4,6-DINITRO-2-METHYLPHENOL	ug/L	52	U	53	U	51	U	54	U
4-BROMOPHENYL PHENYL ETHER	ug/L	10	U	11	U	10	U	11	U
4-CHLORO-3-METHYLPHENOL	ug/L	10	U	11	U	10	U	11	U
4-CHLOROANILINE	ug/L	10	U	11	U	10	U	11	U
4-CHLOROPHENYL PHENYL ETHE	ug/L	10	U	11	U	10	U	11	U
4-METHYLPHENOL (p-CRESOL)	ug/L								
4-NITROANILINE	ug/L	52	U	53	U	51	U	54	U
4-NITROPHENOL	ug/L	52	U	53	U	51	U	54	U
ACENAPHTHENE	ug/L	10	U	11	U	10	U	11	U
ACENAPHTHYLENE	ug/L	10	U	11	U	10	U	11	U
ACETOPHENONE	ug/L								
ANTHRACENE	ug/L	10	U	11	U	10	U	11	U
ATRAZINE	ug/L								
BENZALDEHYDE	ug/L								
BENZO(a)ANTHRACENE	ug/L	10	U	11	U	10	U	11	U
BENZO(a)PYRENE	ug/L	10	U	11	U	10	U	11	U
BENZO(b)FLUORANTHENE	ug/L	10	U	11	U	10	U	11	U

Analytical Data Summary

	StationID	NDW06SW06		NDW06SW07		NDW06SW10		NDW06SW11	
	SampleID	NDW06SW06-R01		NDW06SW07-R01		NDW06SW10K-R01		NDW06SW11K-R01	
	Date Collected	09/29/03		09/29/03		09/29/03		09/29/03	
	SampleType	N		N		N		N	
Parameter	Units								
1,2,4,5-TETRACHLOROBENZENE	ug/L	5	U	5	U	5	U	5.2	U
1,2,4-TRICHLOROBENZENE	ug/L								
1,2-DICHLOROBENZENE	ug/L								
1,3-DICHLOROBENZENE	ug/L								
1,4-DICHLOROBENZENE	ug/L								
2,4,5-TRICHLOROPHENOL	ug/L	20	U	20	U	20	U	20.6	U
2,4,6-TRICHLOROPHENOL	ug/L	5	U	5	U	5	U	5.2	U
2,4-DICHLOROPHENOL	ug/L	5	U	5	U	5	U	5.2	U
2,4-DIMETHYLPHENOL	ug/L	5	U	5	U	5	U	5.2	U
2,4-DINITROPHENOL	ug/L	20	U	20	U	20	U	20.6	U
2,4-DINITROTOLUENE	ug/L	5	U	5	U	5	U	5.2	U
2,6-DINITROTOLUENE	ug/L	5	U	5	U	5	U	5.2	U
2-CHLORONAPHTHALENE	ug/L	5	U	5	U	5	U	5.2	U
2-CHLOROPHENOL	ug/L	5	U	5	U	5	U	5.2	U
2-METHYLNAPHTHALENE	ug/L	5	U	5	U	5	U	5.2	U
2-METHYLPHENOL (o-CRESOL)	ug/L	5	U	5	U	5	U	5.2	U
2-NITROANILINE	ug/L	20	U	20	U	20	U	20.6	U
2-NITROPHENOL	ug/L	5	U	5	U	5	U	5.2	U
3,3'-DICHLOROBENZIDINE	ug/L	5	U	5	U	5	U	5.2	U
3-NITROANILINE	ug/L	20	U	20	U	20	U	20.6	U
4,6-DINITRO-2-METHYLPHENOL	ug/L	20	U	20	U	20	U	20.6	U
4-BROMOPHENYL PHENYL ETHER	ug/L	5	U	5	U	5	U	5.2	U
4-CHLORO-3-METHYLPHENOL	ug/L	5	U	5	U	5	U	5.2	U
4-CHLOROANILINE	ug/L	5	U	5	U	5	U	5.2	U
4-CHLOROPHENYL PHENYL ETHE	ug/L	5	U	5	U	5	U	5.2	U
4-METHYLPHENOL (p-CRESOL)	ug/L	5	U	5	U	5	U	5.2	U
4-NITROANILINE	ug/L	20	U	20	U	20	U	20.6	U
4-NITROPHENOL	ug/L	20	U	20	U	20	U	20.6	U
ACENAPHTHENE	ug/L	5	U	5	U	5	U	5.2	U
ACENAPHTHYLENE	ug/L	5	U	5	U	5	U	5.2	U
ACETOPHENONE	ug/L	5	U	5	U	5	U	5.2	U
ANTHRACENE	ug/L	5	U	5	U	5	U	5.2	U
ATRAZINE	ug/L	5	U	5	U	5	U	5.2	U
BENZALDEHYDE	ug/L	5	U	5	U	5	U	5.2	U
BENZO(a)ANTHRACENE	ug/L	5	U	5	U	5	U	5.2	U
BENZO(a)PYRENE	ug/L	5	U	5	U	5	U	5.2	U
BENZO(b)FLUORANTHENE	ug/L	5	U	5	U	5	U	5.2	U

Analytical Data Summary

	StationID	NDW06SW02		NDW06SW02		NDW06SW03		NDW06SW05	
	SampleID	NDW06FD02P-R01		NDW06SW02-R01		NDW06SW03-R01		NDW06SW05-R01	
	Date Collected	10/01/03		10/01/03		10/01/03		10/01/03	
	SampleType	FD		N		N		N	
Parameter	Units								
1,2,4,5-TETRACHLOROBENZENE	ug/L	5.4	U	5.3	U	10.3	R	5	U
1,2,4-TRICHLOROBENZENE	ug/L								
1,2-DICHLOROBENZENE	ug/L								
1,3-DICHLOROBENZENE	ug/L								
1,4-DICHLOROBENZENE	ug/L								
2,4,5-TRICHLOROPHENOL	ug/L	21.7	U	21	U	41.2	U	20	U
2,4,6-TRICHLOROPHENOL	ug/L	5.4	U	5.3	U	10.3	U	5	U
2,4-DICHLOROPHENOL	ug/L	5.4	U	5.3	U	10.3	U	5	U
2,4-DIMETHYLPHENOL	ug/L	5.4	U	5.3	U	10.3	U	5	U
2,4-DINITROPHENOL	ug/L	21.7	U	21	U	41.2	U	20	U
2,4-DINITROTOLUENE	ug/L	5.4	U	5.3	U	10.3	U	5	U
2,6-DINITROTOLUENE	ug/L	5.4	U	5.3	U	10.3	U	5	U
2-CHLORONAPHTHALENE	ug/L	5.4	U	5.3	U	10.3	U	5	U
2-CHLOROPHENOL	ug/L	5.4	U	5.3	U	10.3	U	5	U
2-METHYLNAPHTHALENE	ug/L	5.4	U	5.3	U	10.3	U	5	U
2-METHYLPHENOL (o-CRESOL)	ug/L	5.4	U	5.3	U	10.3	U	5	U
2-NITROANILINE	ug/L	21.7	U	21	U	41.2	U	20	U
2-NITROPHENOL	ug/L	5.4	U	5.3	U	10.3	U	5	U
3,3'-DICHLOROBENZIDINE	ug/L	5.4	U	5.3	U	10.3	U	5	U
3-NITROANILINE	ug/L	21.7	U	21	U	41.2	U	20	U
4,6-DINITRO-2-METHYLPHENOL	ug/L	21.7	U	21	U	41.2	U	20	U
4-BROMOPHENYL PHENYL ETHER	ug/L	5.4	U	5.3	U	10.3	U	5	U
4-CHLORO-3-METHYLPHENOL	ug/L	5.4	U	5.3	U	10.3	U	5	U
4-CHLOROANILINE	ug/L	5.4	U	5.3	U	10.3	U	5	U
4-CHLOROPHENYL PHENYL ETHE	ug/L	5.4	U	5.3	U	10.3	U	5	U
4-METHYLPHENOL (p-CRESOL)	ug/L	5.4	U	5.3	U	10.3	U	5	U
4-NITROANILINE	ug/L	21.7	U	21	U	41.2	U	20	U
4-NITROPHENOL	ug/L	21.7	U	21	U	41.2	U	20	U
ACENAPHTHENE	ug/L	5.4	U	5.3	U	10.3	U	5	U
ACENAPHTHYLENE	ug/L	5.4	U	5.3	U	10.3	U	5	U
ACETOPHENONE	ug/L	5.4	U	5.3	U	10.3	U	5	U
ANTHRACENE	ug/L	5.4	U	5.3	U	10.3	U	5	U
ATRAZINE	ug/L	5.4	U	5.3	U	10.3	U	5	U
BENZALDEHYDE	ug/L	5.4	U	5.3	U	10.3	U	5	U
BENZO(a)ANTHRACENE	ug/L	5.4	U	5.3	U	10.3	U	5	U
BENZO(a)PYRENE	ug/L	5.4	U	5.3	U	10.3	U	5	U
BENZO(b)FLUORANTHENE	ug/L	5.4	U	5.3	U	10.3	U	5	U

Analytical Data Summary

	StationID	NDW06SW08		NDW06SW09	
	SampleID	NDW06SW08-R01		NDW06SW09-R01	
	Date Collected	10/01/03		10/01/03	
	SampleType	N		N	
Parameter	Units				
1,2,4,5-TETRACHLOROBENZENE	ug/L	5	U	5.2	U
1,2,4-TRICHLOROBENZENE	ug/L				
1,2-DICHLOROBENZENE	ug/L				
1,3-DICHLOROBENZENE	ug/L				
1,4-DICHLOROBENZENE	ug/L				
2,4,5-TRICHLOROPHENOL	ug/L	20.2	U	20.8	U
2,4,6-TRICHLOROPHENOL	ug/L	5	U	5.2	U
2,4-DICHLOROPHENOL	ug/L	5	U	5.2	U
2,4-DIMETHYLPHENOL	ug/L	5	U	5.2	U
2,4-DINITROPHENOL	ug/L	20.2	U	20.8	U
2,4-DINITROTOLUENE	ug/L	5	U	5.2	U
2,6-DINITROTOLUENE	ug/L	5	U	5.2	U
2-CHLORONAPHTHALENE	ug/L	5	U	5.2	U
2-CHLOROPHENOL	ug/L	5	U	5.2	U
2-METHYLNAPHTHALENE	ug/L	5	U	5.2	U
2-METHYLPHENOL (o-CRESOL)	ug/L	5	U	5.2	U
2-NITROANILINE	ug/L	20.2	U	20.8	U
2-NITROPHENOL	ug/L	5	U	5.2	U
3,3'-DICHLOROBENZIDINE	ug/L	5	U	5.2	U
3-NITROANILINE	ug/L	20.2	U	20.8	U
4,6-DINITRO-2-METHYLPHENOL	ug/L	20.2	U	20.8	U
4-BROMOPHENYL PHENYL ETHER	ug/L	5	U	5.2	U
4-CHLORO-3-METHYLPHENOL	ug/L	5	U	5.2	U
4-CHLOROANILINE	ug/L	5	U	5.2	U
4-CHLOROPHENYL PHENYL ETHE	ug/L	5	U	5.2	U
4-METHYLPHENOL (p-CRESOL)	ug/L	5	U	5.2	U
4-NITROANILINE	ug/L	20.2	U	20.8	U
4-NITROPHENOL	ug/L	20.2	U	20.8	U
ACENAPHTHENE	ug/L	5	U	5.2	U
ACENAPHTHYLENE	ug/L	5	U	5.2	U
ACETOPHENONE	ug/L	5	U	5.2	U
ANTHRACENE	ug/L	5	U	5.2	U
ATRAZINE	ug/L	5	U	5.2	U
BENZALDEHYDE	ug/L	5	U	5.2	U
BENZO(a)ANTHRACENE	ug/L	5	U	5.2	U
BENZO(a)PYRENE	ug/L	5	U	5.2	U
BENZO(b)FLUORANTHENE	ug/L	5	U	5.2	U

Analytical Data Summary

	StationID	W6-SW01		W6-SW02		W6-SW03		W6-SW03	
	SampleID	NDA035		NDA036		NDA037		NDA038FD1	
	Date Collected	04/13/00		04/13/00		04/13/00		04/13/00	
	SampleType	N		N		N		FD	
Parameter	Units								
BENZO(g,h,i)PERYLENE	ug/L	10	U	10	U	10	U	10	U
BENZO(k)FLUORANTHENE	ug/L	10	U	10	U	10	U	10	U
BENZYL BUTYL PHTHALATE	ug/L	10	U	10	U	10	U	10	U
BIPHENYL (DIPHENYL)	ug/L								
bis(2-CHLOROETHOXY) METHANE	ug/L	10	U	10	U	10	U	10	U
bis(2-CHLOROETHYL) ETHER (2-C	ug/L	10	U	10	U	10	U	10	U
bis(2-CHLOROISOPROPYL) ETHER	ug/L	10	U	10	U	10	U	10	U
bis(2-ETHYLHEXYL) PHTHALATE	ug/L	10	U	10	U	10	U	10	U
CAPROLACTAM	ug/L								
CARBAZOLE	ug/L	10	U	10	U	10	U	10	U
CHRYSENE	ug/L	10	U	10	U	10	U	10	U
CRESOLS, m & p	ug/L	10	U	10	U	10	U	10	U
DI-n-BUTYL PHTHALATE	ug/L	10	U	10	U	10	U	10	U
DI-n-OCTYLPHTHALATE	ug/L	10	U	10	U	10	U	10	U
DIBENZ(a,h)ANTHRACENE	ug/L	10	U	10	U	10	U	10	U
DIBENZOFURAN	ug/L	10	U	10	U	10	U	10	U
DIETHYL PHTHALATE	ug/L	0.6	J	0.5	J	0.5	J	0.5	J
DIMETHYL PHTHALATE	ug/L	10	U	10	U	10	U	10	U
FLUORANTHENE	ug/L	10	U	10	U	10	U	10	U
FLUORENE	ug/L	10	U	10	U	10	U	10	U
HEXACHLOROBENZENE	ug/L	10	U	10	U	10	U	10	U
HEXACHLOROBUTADIENE	ug/L	10	U	10	U	10	U	10	U
HEXACHLOROCYCLOPENTADIENE	ug/L	10	U	10	U	10	U	10	U
HEXACHLOROETHANE	ug/L	10	U	10	U	10	U	10	U
INDENO(1,2,3-c,d)PYRENE	ug/L	10	U	10	U	10	U	10	U
ISOPHORONE	ug/L	10	U	10	U	10	U	10	U
N-NITROSODI-n-PROPYLAMINE	ug/L	10	U	10	U	10	U	10	U
N-NITROSODIPHENYLAMINE	ug/L	10	U	10	U	10	U	10	U
NAPHTHALENE	ug/L	10	U	10	U	10	U	10	U
NITROBENZENE	ug/L	10	U	10	U	10	U	10	U
PENTACHLOROPHENOL	ug/L	52	U	51	U	51	U	52	U
PHENANTHRENE	ug/L	10	U	10	U	10	U	10	U
PHENOL	ug/L	10	U	10	U	10	U	10	U
PYRENE	ug/L	10	U	10	U	10	U	10	U

Analytical Data Summary

	StationID	W6-SW04		W6-SW05		W6-SW06		W6-SW07	
	SampleID	NDA039		NDA040		NDA300		NDA301	
	Date Collected	04/13/00		04/13/00		04/13/00		04/13/00	
	SampleType	N		N		N		N	
Parameter	Units								
BENZO(g,h,i)PERYLENE	ug/L	10	U	11	U	10	U	11	U
BENZO(k)FLUORANTHENE	ug/L	10	U	11	U	10	U	11	U
BENZYL BUTYL PHTHALATE	ug/L	10	U	11	U	10	U	11	U
BIPHENYL (DIPHENYL)	ug/L								
bis(2-CHLOROETHOXY) METHANE	ug/L	10	U	11	U	10	U	11	U
bis(2-CHLOROETHYL) ETHER (2-C	ug/L	10	U	11	U	10	U	11	U
bis(2-CHLOROISOPROPYL) ETHER	ug/L	10	U	11	U	10	U	11	U
bis(2-ETHYLHEXYL) PHTHALATE	ug/L	10	U	11	U	10	U	11	U
CAPROLACTAM	ug/L								
CARBAZOLE	ug/L	10	U	11	U	10	U	11	U
CHRYSENE	ug/L	10	U	11	U	10	U	11	U
CRESOLS, m & p	ug/L	10	U	11	U	10	U	11	U
DI-n-BUTYL PHTHALATE	ug/L	10	U	11	U	10	U	11	U
DI-n-OCTYLPHTHALATE	ug/L	10	U	11	U	10	U	11	U
DIBENZ(a,h)ANTHRACENE	ug/L	10	U	11	U	10	U	11	U
DIBENZOFURAN	ug/L	10	U	11	U	10	U	11	U
DIETHYL PHTHALATE	ug/L	10	U	11	U	10	U	11	U
DIMETHYL PHTHALATE	ug/L	10	U	11	U	10	U	11	U
FLUORANTHENE	ug/L	10	U	11	U	10	U	11	U
FLUORENE	ug/L	10	U	11	U	10	U	11	U
HEXACHLOROBENZENE	ug/L	10	U	11	U	10	U	11	U
HEXACHLOROBUTADIENE	ug/L	10	U	11	U	10	U	11	U
HEXACHLOROCYCLOPENTADIENE	ug/L	10	U	11	U	10	U	11	U
HEXACHLOROETHANE	ug/L	10	U	11	U	10	U	11	U
INDENO(1,2,3-c,d)PYRENE	ug/L	10	U	11	U	10	U	11	U
ISOPHORONE	ug/L	10	U	11	U	10	U	11	U
N-NITROSODI-n-PROPYLAMINE	ug/L	10	U	11	U	10	U	11	U
N-NITROSODIPHENYLAMINE	ug/L	10	U	11	U	10	U	11	U
NAPHTHALENE	ug/L	10	U	11	U	10	U	11	U
NITROBENZENE	ug/L	10	U	11	U	10	U	11	U
PENTACHLOROPHENOL	ug/L	52	U	53	U	51	U	54	U
PHENANTHRENE	ug/L	10	U	11	U	10	U	11	U
PHENOL	ug/L	10	U	11	U	10	U	11	U
PYRENE	ug/L	10	U	11	U	10	U	11	U

Analytical Data Summary

	StationID	NDW06SW06		NDW06SW07		NDW06SW10		NDW06SW11	
	SampleID	NDW06SW06-R01		NDW06SW07-R01		NDW06SW10K-R01		NDW06SW11K-R01	
	Date Collected	09/29/03		09/29/03		09/29/03		09/29/03	
	SampleType	N		N		N		N	
Parameter	Units								
BENZO(g,h,i)PERYLENE	ug/L	5	U	5	U	5	U	5.2	U
BENZO(k)FLUORANTHENE	ug/L	5	U	5	U	5	U	5.2	U
BENZYL BUTYL PHTHALATE	ug/L	5	U	5	U	5	U	5.2	U
BIPHENYL (DIPHENYL)	ug/L	5	U	5	U	5	U	5.2	U
bis(2-CHLOROETHOXY) METHANE	ug/L	5	U	5	U	5	U	5.2	U
bis(2-CHLOROETHYL) ETHER (2-C	ug/L	5	U	5	U	5	U	5.2	U
bis(2-CHLOROISOPROPYL) ETHER	ug/L	5	U	5	U	5	U	5.2	U
bis(2-ETHYLHEXYL) PHTHALATE	ug/L	10	U	10	U	10	U	10.3	U
CAPROLACTAM	ug/L	5	R	5	R	5	R	5.2	R
CARBAZOLE	ug/L	10	U	10	U	10	U	10.3	U
CHRYSENE	ug/L	5	U	5	U	5	U	5.2	U
CRESOLS, m & p	ug/L								
DI-n-BUTYL PHTHALATE	ug/L	5	U	5	U	5	U	5.2	U
DI-n-OCTYLPHTHALATE	ug/L	5	U	5	U	5	U	6.9	=
DIBENZ(a,h)ANTHRACENE	ug/L	5	U	5	U	5	U	5.2	U
DIBENZOFURAN	ug/L	5	U	5	U	5	U	5.2	U
DIETHYL PHTHALATE	ug/L	5	U	5	U	5	U	5.2	U
DIMETHYL PHTHALATE	ug/L	5	U	5	U	5	U	5.2	U
FLUORANTHENE	ug/L	5	U	5	U	5	U	5.2	U
FLUORENE	ug/L	5	U	5	U	5	U	5.2	U
HEXACHLOROBENZENE	ug/L	5	U	5	U	5	U	5.2	U
HEXACHLOROBUTADIENE	ug/L	5	U	5	U	5	U	5.2	U
HEXACHLOROCYCLOPENTADIENE	ug/L	5	U	5	U	5	U	5.2	U
HEXACHLOROETHANE	ug/L	5	U	5	U	5	U	5.2	U
INDENO(1,2,3-c,d)PYRENE	ug/L	5	U	5	U	5	U	5.2	U
ISOPHORONE	ug/L	5	U	5	U	5	U	5.2	U
N-NITROSODI-n-PROPYLAMINE	ug/L	5	U	5	U	5	U	5.2	U
N-NITROSODIPHENYLAMINE	ug/L	5	U	5	U	5	U	5.2	U
NAPHTHALENE	ug/L	5	U	5	U	5	U	5.2	U
NITROBENZENE	ug/L	5	U	5	U	5	U	5.2	U
PENTACHLOROPHENOL	ug/L	20	U	20	U	20	U	20.6	U
PHENANTHRENE	ug/L	5	U	5	U	5	U	5.2	U
PHENOL	ug/L	5	U	5	U	5	U	5.2	U
PYRENE	ug/L	5	U	5	U	5	U	5.2	U

Analytical Data Summary

	StationID	NDW06SW02		NDW06SW02		NDW06SW03		NDW06SW05	
	SampleID	NDW06FD02P-R01		NDW06SW02-R01		NDW06SW03-R01		NDW06SW05-R01	
	Date Collected	10/01/03		10/01/03		10/01/03		10/01/03	
	SampleType	FD		N		N		N	
Parameter	Units								
BENZO(g,h,i)PERYLENE	ug/L	5.4	U	5.3	U	10.3	U	5	U
BENZO(k)FLUORANTHENE	ug/L	5.4	U	5.3	U	10.3	U	5	U
BENZYL BUTYL PHTHALATE	ug/L	5.4	U	5.3	U	10.3	U	5	U
BIPHENYL (DIPHENYL)	ug/L	5.4	U	5.3	U	10.3	U	5	U
bis(2-CHLOROETHOXY) METHANE	ug/L	5.4	U	5.3	U	10.3	U	5	U
bis(2-CHLOROETHYL) ETHER (2-C	ug/L	5.4	U	5.3	U	10.3	U	5	U
bis(2-CHLOROISOPROPYL) ETHER	ug/L	5.4	U	5.3	U	10.3	U	5	U
bis(2-ETHYLHEXYL) PHTHALATE	ug/L	10.9	U	10.5	U	20.6	U	10	U
CAPROLACTAM	ug/L	5.4	R	5.3	R	10.3	R	5	R
CARBAZOLE	ug/L	10.9	U	10.5	U	20.6	U	10	U
CHRYSENE	ug/L	5.4	U	5.3	U	10.3	U	5	U
CRESOLS, m & p	ug/L								
DI-n-BUTYL PHTHALATE	ug/L	5.4	U	5.3	U	10.3	U	5	U
DI-n-OCTYLPHTHALATE	ug/L	5.4	U	5.3	U	10.3	U	5	U
DIBENZ(a,h)ANTHRACENE	ug/L	5.4	U	5.3	U	10.3	U	5	U
DIBENZOFURAN	ug/L	5.4	U	5.3	U	10.3	U	5	U
DIETHYL PHTHALATE	ug/L	5.4	U	5.3	U	10.3	U	5	U
DIMETHYL PHTHALATE	ug/L	5.4	U	5.3	U	10.3	U	5	U
FLUORANTHENE	ug/L	5.4	U	5.3	U	10.3	U	5	U
FLUORENE	ug/L	5.4	U	5.3	U	10.3	U	5	U
HEXACHLOROBENZENE	ug/L	5.4	U	5.3	U	10.3	U	5	U
HEXACHLOROBUTADIENE	ug/L	5.4	U	5.3	U	10.3	U	5	U
HEXACHLOROCYCLOPENTADIENE	ug/L	5.4	U	5.3	U	10.3	U	5	U
HEXACHLOROETHANE	ug/L	5.4	U	5.3	U	10.3	U	5	U
INDENO(1,2,3-c,d)PYRENE	ug/L	5.4	U	5.3	U	10.3	U	5	U
ISOPHORONE	ug/L	5.4	U	5.3	U	10.3	U	5	U
N-NITROSODI-n-PROPYLAMINE	ug/L	5.4	U	5.3	U	10.3	U	5	U
N-NITROSODIPHENYLAMINE	ug/L	5.4	U	5.3	U	10.3	U	5	U
NAPHTHALENE	ug/L	5.4	U	5.3	U	10.3	U	5	U
NITROBENZENE	ug/L	5.4	U	5.3	U	10.3	U	5	U
PENTACHLOROPHENOL	ug/L	21.7	U	21	U	41.2	U	20	U
PHENANTHRENE	ug/L	5.4	U	5.3	U	10.3	U	5	U
PHENOL	ug/L	5.4	U	5.3	U	10.3	U	5	U
PYRENE	ug/L	5.4	U	5.3	U	10.3	U	5	U

Analytical Data Summary

	StationID	NDW06SW08		NDW06SW09	
	SampleID	NDW06SW08-R01		NDW06SW09-R01	
	Date Collected	10/01/03		10/01/03	
	SampleType	N		N	
Parameter	Units				
BENZO(g,h,i)PERYLENE	ug/L	5	U	5.2	U
BENZO(k)FLUORANTHENE	ug/L	5	U	5.2	U
BENZYL BUTYL PHTHALATE	ug/L	5	U	5.2	U
BIPHENYL (DIPHENYL)	ug/L	5	U	5.2	U
bis(2-CHLOROETHOXY) METHANE	ug/L	5	U	5.2	U
bis(2-CHLOROETHYL) ETHER (2-C	ug/L	5	U	5.2	U
bis(2-CHLOROISOPROPYL) ETHER	ug/L	5	U	5.2	U
bis(2-ETHYLHEXYL) PHTHALATE	ug/L	10.1	U	10.4	U
CAPROLACTAM	ug/L	5	R	5.2	R
CARBAZOLE	ug/L	10.1	U	10.4	U
CHRYSENE	ug/L	5	U	5.2	U
CRESOLS, m & p	ug/L				
DI-n-BUTYL PHTHALATE	ug/L	5	U	5.2	U
DI-n-OCTYLPHTHALATE	ug/L	5	U	6	=
DIBENZ(a,h)ANTHRACENE	ug/L	5	U	5.2	U
DIBENZOFURAN	ug/L	5	U	5.2	U
DIETHYL PHTHALATE	ug/L	5	U	5.2	U
DIMETHYL PHTHALATE	ug/L	5	U	5.2	U
FLUORANTHENE	ug/L	5	U	5.2	U
FLUORENE	ug/L	5	U	5.2	U
HEXACHLOROBENZENE	ug/L	5	U	5.2	U
HEXACHLOROBUTADIENE	ug/L	5	U	5.2	U
HEXACHLOROCYCLOPENTADIENE	ug/L	5	U	5.2	U
HEXACHLOROETHANE	ug/L	5	U	5.2	U
INDENO(1,2,3-c,d)PYRENE	ug/L	5	U	5.2	U
ISOPHORONE	ug/L	5	U	5.2	U
N-NITROSODI-n-PROPYLAMINE	ug/L	5	U	5.2	U
N-NITROSODIPHENYLAMINE	ug/L	5	U	5.2	U
NAPHTHALENE	ug/L	5	U	5.2	U
NITROBENZENE	ug/L	5	U	5.2	U
PENTACHLOROPHENOL	ug/L	20.2	U	20.8	U
PHENANTHRENE	ug/L	5	U	5.2	U
PHENOL	ug/L	5	U	5.2	U
PYRENE	ug/L	5	U	5.2	U

Analytical Data Summary

Parameter	StationID	W6-SW01		W6-SW02		W6-SW03		W6-SW03	
	SampleID	NDA035		NDA036		NDA037		NDA038FD1	
	Date Collected	04/13/00		04/13/00		04/13/00		04/13/00	
	SampleType	N		N		N		FD	
	Units								
ACETONE	ug/L	10	R	10	R	10	R	10	R
BROMODICHLOROMETHANE	ug/L	10	U	10	U	10	U	10	U
BROMOCHLOROMETHANE	ug/L								
BROMOMETHANE	ug/L	10	U	10	U	10	U	10	U
BENZENE	ug/L	10	U	10	U	10	U	10	U
TOLUENE	ug/L	10	U	10	U	10	U	10	U
CARBON DISULFIDE	ug/L	10	U	10	U	10	U	10	U
METHYLCYCLOHEXANE	ug/L								
CHLOROBENZENE	ug/L	10	U	10	U	10	U	10	U
CHLOROETHANE	ug/L	10	U	10	U	10	U	10	U
CHLOROMETHANE	ug/L	10	U	10	U	10	U	10	U
CARBON TETRACHLORIDE	ug/L	10	U	10	U	10	U	10	U
CYCLOHEXANE	ug/L								
DIBROMOCHLOROMETHANE	ug/L	10	U	10	U	10	U	10	U
1,2-DIBROMO-3-CHLOROPROPANE	ug/L								
1,1-DICHLOROETHANE	ug/L	10	U	10	U	10	U	10	U
1,2-DICHLOROETHANE	ug/L	10	U	10	U	10	U	10	U
1,2-DICHLOROBENZENE	ug/L								
1,3-DICHLOROBENZENE	ug/L								
1,4-DICHLOROBENZENE	ug/L								
1,1-DICHLOROETHENE	ug/L	10	U	10	U	10	U	10	U
cis-1,2-DICHLOROETHYLENE	ug/L								
trans-1,2-DICHLOROETHENE	ug/L								
cis-1,3-DICHLOROPROPENE	ug/L	10	U	10	U	10	U	10	U
trans-1,3-DICHLOROPROPENE	ug/L	10	U	10	U	10	U	10	U
1,2-DICHLOROPROPANE	ug/L	10	U	10	U	10	U	10	U
ETHYLBENZENE	ug/L	10	U	10	U	10	U	10	U
1,2-DIBROMOETHANE (ETHYLENE DIBR	ug/L								
TRICHLOROFLUOROMETHANE	ug/L								
1,1,2-TRICHLORO-1,2,2-TRIFLUOROETH	ug/L								
DICHLORODIFLUOROMETHANE	ug/L								
2-HEXANONE	ug/L	10	U	10	U	10	U	10	U
ISOPROPYLBENZENE (CUMENE)	ug/L								
METHYL ACETATE	ug/L								
METHYL ETHYL KETONE (2-BUTANONE)	ug/L	10	R	10	R	10	R	10	R
METHYL ISOBUTYL KETONE (4-METHYL	ug/L	10	U	10	U	10	U	10	U
METHYLENE CHLORIDE	ug/L	10	U	10	U	10	U	10	U

Analytical Data Summary

Parameter	StationID	W6-SW04		W6-SW05		W6-SW06		W6-SW07	
	SampleID	NDA039		NDA040		NDA300		NDA301	
	Date Collected	04/13/00		04/13/00		04/13/00		04/13/00	
	SampleType	N		N		N		N	
	Units								
ACETONE	ug/L	10	R	10	R	10	R	10	R
BROMODICHLOROMETHANE	ug/L	10	U	10	U	10	U	10	U
BROMOCHLOROMETHANE	ug/L								
BROMOMETHANE	ug/L	10	U	10	U	10	U	10	U
BENZENE	ug/L	10	U	10	U	10	U	10	U
TOLUENE	ug/L	10	U	10	U	10	U	10	U
CARBON DISULFIDE	ug/L	10	U	10	U	10	U	10	U
METHYLCYCLOHEXANE	ug/L								
CHLOROBENZENE	ug/L	10	U	10	U	10	U	10	U
CHLOROETHANE	ug/L	10	U	10	U	10	U	10	U
CHLOROMETHANE	ug/L	10	U	10	U	10	U	10	U
CARBON TETRACHLORIDE	ug/L	10	U	10	U	10	U	10	U
CYCLOHEXANE	ug/L								
DIBROMOCHLOROMETHANE	ug/L	10	U	10	U	10	U	10	U
1,2-DIBROMO-3-CHLOROPROPANE	ug/L								
1,1-DICHLOROETHANE	ug/L	10	U	10	U	10	U	10	U
1,2-DICHLOROETHANE	ug/L	10	U	10	U	10	U	10	U
1,2-DICHLOROBENZENE	ug/L								
1,3-DICHLOROBENZENE	ug/L								
1,4-DICHLOROBENZENE	ug/L								
1,1-DICHLOROETHENE	ug/L	10	U	10	U	10	U	10	U
cis-1,2-DICHLOROETHYLENE	ug/L								
trans-1,2-DICHLOROETHENE	ug/L								
cis-1,3-DICHLOROPROPENE	ug/L	10	U	10	U	10	U	10	U
trans-1,3-DICHLOROPROPENE	ug/L	10	U	10	U	10	U	10	U
1,2-DICHLOROPROPANE	ug/L	10	U	10	U	10	U	10	U
ETHYLBENZENE	ug/L	10	U	10	U	10	U	10	U
1,2-DIBROMOETHANE (ETHYLENE DIBR	ug/L								
TRICHLOROFLUOROMETHANE	ug/L								
1,1,2-TRICHLORO-1,2,2-TRIFLUOROETH	ug/L								
DICHLORODIFLUOROMETHANE	ug/L								
2-HEXANONE	ug/L	10	U	10	U	10	U	10	U
ISOPROPYLBENZENE (CUMENE)	ug/L								
METHYL ACETATE	ug/L								
METHYL ETHYL KETONE (2-BUTANONE)	ug/L	10	R	10	R	10	R	10	R
METHYL ISOBUTYL KETONE (4-METHYL	ug/L	10	U	10	U	10	U	10	U
METHYLENE CHLORIDE	ug/L	10	U	10	U	10	U	10	U

Analytical Data Summary

	StationID	NDW06SW06		NDW06SW07		NDW06SW10		NDW06SW11	
	SampleID	NDW06SW06-R01		NDW06SW07-R01		NDW06SW10K-R01		NDW06SW11K-R01	
	Date Collected	09/29/03		09/29/03		09/29/03		09/29/03	
	SampleType	N		N		N		N	
Parameter	Units								
ACETONE	ug/L	5	U	5	U	5.7	U	6.2	U
BROMODICHLOROMETHANE	ug/L	0.5	U	0.5	U	0.5	U	0.5	U
BROMOCHLOROMETHANE	ug/L	0.5	U	0.5	U	0.5	U	0.5	U
BROMOMETHANE	ug/L	0.5	U	0.5	U	0.5	U	0.5	U
BENZENE	ug/L	0.5	U	0.5	U	0.5	U	0.5	U
TOLUENE	ug/L	0.5	U	0.5	U	0.5	U	0.5	U
CARBON DISULFIDE	ug/L	0.5	U	0.5	U	0.5	U	0.5	U
METHYLCYCLOHEXANE	ug/L	0.5	U	0.5	U	0.5	U	0.5	U
CHLOROBENZENE	ug/L	0.5	U	0.5	U	0.5	U	0.5	U
CHLOROETHANE	ug/L	0.5	U	0.5	U	0.5	U	0.5	U
CHLOROMETHANE	ug/L	0.5	U	0.5	U	0.5	U	0.5	U
CARBON TETRACHLORIDE	ug/L	0.5	U	0.5	U	0.5	U	0.5	U
CYCLOHEXANE	ug/L	0.5	U	0.5	U	0.5	U	0.5	U
DIBROMOCHLOROMETHANE	ug/L	0.5	U	0.5	U	0.5	U	0.5	U
1,2-DIBROMO-3-CHLOROPROPANE	ug/L	2	U	2	U	2	U	2	U
1,1-DICHLOROETHANE	ug/L	0.5	U	0.5	U	0.5	U	0.5	U
1,2-DICHLOROETHANE	ug/L	0.5	U	0.5	U	0.5	U	0.5	U
1,2-DICHLOROBENZENE	ug/L	0.5	U	0.5	U	0.5	U	0.5	U
1,3-DICHLOROBENZENE	ug/L	0.5	U	0.5	U	0.5	U	0.5	U
1,4-DICHLOROBENZENE	ug/L	0.5	U	0.5	U	0.5	U	0.5	U
1,1-DICHLOROETHENE	ug/L	0.5	U	0.5	U	0.5	U	0.5	U
cis-1,2-DICHLOROETHYLENE	ug/L	0.5	U	0.5	U	0.5	U	0.5	U
trans-1,2-DICHLOROETHENE	ug/L	0.5	U	0.5	U	0.5	U	0.5	U
cis-1,3-DICHLOROPROPENE	ug/L	0.5	U	0.5	U	0.5	U	0.5	U
trans-1,3-DICHLOROPROPENE	ug/L	0.5	U	0.5	U	0.5	U	0.5	U
1,2-DICHLOROPROPANE	ug/L	0.5	U	0.5	U	0.5	U	0.5	U
ETHYLBENZENE	ug/L	0.5	U	0.5	U	0.5	U	0.5	U
1,2-DIBROMOETHANE (ETHYLENE DIBR	ug/L	0.5	U	0.5	U	0.5	U	0.5	U
TRICHLOROFLUOROMETHANE	ug/L	0.5	U	0.5	U	0.5	U	0.5	U
1,1,2-TRICHLORO-1,2,2-TRIFLUOROETH/	ug/L	0.5	U	0.5	U	0.5	U	0.5	U
DICHLORODIFLUOROMETHANE	ug/L	0.5	U	0.5	U	0.5	U	0.5	U
2-HEXANONE	ug/L	5	U	5	U	5	U	5	U
ISOPROPYLBENZENE (CUMENE)	ug/L	0.5	R	0.5	R	0.5	R	0.5	R
METHYL ACETATE	ug/L	2	U	2	U	2	U	2	U
METHYL ETHYL KETONE (2-BUTANONE)	ug/L	5	U	5	U	5	U	5	U
METHYL ISOBUTYL KETONE (4-METHYL	ug/L	5	U	5	U	5	U	5	U
METHYLENE CHLORIDE	ug/L	0.5	U	0.5	U	0.5	U	0.5	U

Analytical Data Summary

	StationID	NDW06SW02		NDW06SW02		NDW06SW03		NDW06SW05	
	SampleID	NDW06FD02P-R01		NDW06SW02-R01		NDW06SW03-R01		NDW06SW05-R01	
	Date Collected	10/01/03		10/01/03		10/01/03		10/01/03	
	SampleType	FD		N		N		N	
Parameter	Units								
ACETONE	ug/L	5	U	5	U	5	U	5	U
BROMODICHLOROMETHANE	ug/L	0.5	U	0.5	U	0.5	U	0.5	U
BROMOCHLOROMETHANE	ug/L	0.5	U	0.5	U	0.5	U	0.5	U
BROMOMETHANE	ug/L	0.5	U	0.5	U	0.5	U	0.5	U
BENZENE	ug/L	0.5	U	0.5	U	0.5	U	0.5	U
TOLUENE	ug/L	0.5	U	0.5	U	0.5	U	0.5	U
CARBON DISULFIDE	ug/L	0.5	U	0.5	U	0.5	U	0.5	U
METHYLCYCLOHEXANE	ug/L	0.5	U	0.5	U	0.5	U	0.5	U
CHLOROBENZENE	ug/L	0.5	U	0.5	U	0.5	U	0.5	U
CHLOROETHANE	ug/L	0.5	U	0.5	U	0.5	U	0.5	U
CHLOROMETHANE	ug/L	0.5	U	0.5	U	0.5	U	0.5	U
CARBON TETRACHLORIDE	ug/L	0.5	U	0.5	U	0.5	U	0.5	U
CYCLOHEXANE	ug/L	0.5	U	0.5	U	0.5	U	0.5	U
DIBROMOCHLOROMETHANE	ug/L	0.5	U	0.5	U	0.5	U	0.5	U
1,2-DIBROMO-3-CHLOROPROPANE	ug/L	2	U	2	U	2	U	2	U
1,1-DICHLOROETHANE	ug/L	0.5	U	0.5	U	0.5	U	0.5	U
1,2-DICHLOROETHANE	ug/L	0.5	U	0.5	U	0.5	U	0.5	U
1,2-DICHLOROBENZENE	ug/L	0.5	U	0.5	U	0.5	U	0.5	U
1,3-DICHLOROBENZENE	ug/L	0.5	U	0.5	U	0.5	U	0.5	U
1,4-DICHLOROBENZENE	ug/L	0.5	U	0.5	U	0.5	U	0.5	U
1,1-DICHLOROETHENE	ug/L	0.5	U	0.5	U	0.5	U	0.5	U
cis-1,2-DICHLOROETHYLENE	ug/L	0.5	U	0.5	U	0.5	U	0.5	U
trans-1,2-DICHLOROETHENE	ug/L	0.5	U	0.5	U	0.5	U	0.5	U
cis-1,3-DICHLOROPROPENE	ug/L	0.5	U	0.5	U	0.5	U	0.5	U
trans-1,3-DICHLOROPROPENE	ug/L	0.5	U	0.5	U	0.5	U	0.5	U
1,2-DICHLOROPROPANE	ug/L	0.5	U	0.5	U	0.5	U	0.5	U
ETHYLBENZENE	ug/L	0.5	U	0.5	U	0.5	U	0.5	U
1,2-DIBROMOETHANE (ETHYLENE DIBR	ug/L	0.5	U	0.5	U	0.5	U	0.5	U
TRICHLOROFLUOROMETHANE	ug/L	0.5	U	0.5	U	0.5	U	0.5	U
1,1,2-TRICHLORO-1,2,2-TRIFLUOROETH/	ug/L	0.5	U	0.5	U	0.5	U	0.5	U
DICHLORODIFLUOROMETHANE	ug/L	0.5	U	0.5	U	0.5	U	0.5	U
2-HEXANONE	ug/L	5	U	5	U	5	U	5	U
ISOPROPYLBENZENE (CUMENE)	ug/L	0.5	R	0.5	R	0.5	R	0.5	R
METHYL ACETATE	ug/L	2	U	2	U	2	U	2	U
METHYL ETHYL KETONE (2-BUTANONE)	ug/L	5	U	5	U	5	U	5	U
METHYL ISOBUTYL KETONE (4-METHYL	ug/L	5	U	5	U	5	U	5	U
METHYLENE CHLORIDE	ug/L	0.5	U	0.5	U	0.5	U	0.5	U

Analytical Data Summary

	StationID	NDW06SW08		NDW06SW09	
	SampleID	NDW06SW08-R01		NDW06SW09-R01	
	Date Collected	10/01/03		10/01/03	
	SampleType	N		N	
Parameter	Units				
ACETONE	ug/L	5	U	5	U
BROMODICHLOROMETHANE	ug/L	0.5	U	0.5	U
BROMOCHLOROMETHANE	ug/L	0.5	U	0.5	U
BROMOMETHANE	ug/L	0.5	U	0.5	U
BENZENE	ug/L	0.5	U	0.5	U
TOLUENE	ug/L	0.5	U	0.5	U
CARBON DISULFIDE	ug/L	0.5	U	0.5	U
METHYLCYCLOHEXANE	ug/L	0.5	U	0.5	U
CHLOROBENZENE	ug/L	0.5	U	0.5	U
CHLOROETHANE	ug/L	0.5	U	0.5	U
CHLOROMETHANE	ug/L	0.5	U	0.5	U
CARBON TETRACHLORIDE	ug/L	0.5	U	0.5	U
CYCLOHEXANE	ug/L	0.5	U	0.5	U
DIBROMOCHLOROMETHANE	ug/L	0.5	U	0.5	U
1,2-DIBROMO-3-CHLOROPROPANE	ug/L	2	U	2	U
1,1-DICHLOROETHANE	ug/L	0.5	U	0.5	U
1,2-DICHLOROETHANE	ug/L	0.5	U	0.5	U
1,2-DICHLOROBENZENE	ug/L	0.5	U	0.5	U
1,3-DICHLOROBENZENE	ug/L	0.5	U	0.5	U
1,4-DICHLOROBENZENE	ug/L	0.5	U	0.5	U
1,1-DICHLOROETHENE	ug/L	0.5	U	0.5	U
cis-1,2-DICHLOROETHYLENE	ug/L	0.5	U	0.5	U
trans-1,2-DICHLOROETHENE	ug/L	0.5	U	0.5	U
cis-1,3-DICHLOROPROPENE	ug/L	0.5	U	0.5	U
trans-1,3-DICHLOROPROPENE	ug/L	0.5	U	0.5	U
1,2-DICHLOROPROPANE	ug/L	0.5	U	0.5	U
ETHYLBENZENE	ug/L	0.5	U	0.5	U
1,2-DIBROMOETHANE (ETHYLENE DIBR	ug/L	0.5	U	0.5	U
TRICHLOROFLUOROMETHANE	ug/L	0.5	U	0.5	U
1,1,2-TRICHLORO-1,2,2-TRIFLUOROETH	ug/L	0.5	U	0.5	U
DICHLORODIFLUOROMETHANE	ug/L	0.5	U	0.5	U
2-HEXANONE	ug/L	5	U	5	U
ISOPROPYLBENZENE (CUMENE)	ug/L	0.5	R	0.5	R
METHYL ACETATE	ug/L	2	U	2	U
METHYL ETHYL KETONE (2-BUTANONE)	ug/L	5	U	5	U
METHYL ISOBUTYL KETONE (4-METHYL	ug/L	5	U	5	U
METHYLENE CHLORIDE	ug/L	0.5	U	0.5	U

Analytical Data Summary

	StationID	W6-SW01		W6-SW02		W6-SW03		W6-SW03	
	SampleID	NDA035		NDA036		NDA037		NDA038FD1	
	Date Collected	04/13/00		04/13/00		04/13/00		04/13/00	
	SampleType	N		N		N		FD	
Parameter	Units								
1,1,2,2-TETRACHLOROETHANE	ug/L	10	U	10	U	10	U	10	U
TETRACHLOROETHYLENE(PCE)	ug/L	10	U	10	U	10	U	10	U
STYRENE	ug/L	10	U	10	U	10	U	10	U
BROMOFORM	ug/L	10	U	10	U	10	U	10	U
tert-BUTYL METHYL ETHER	ug/L								
1,1,1-TRICHLOROETHANE	ug/L	10	U	10	U	10	U	10	U
1,1,2-TRICHLOROETHANE	ug/L	10	U	10	U	10	U	10	U
1,2,3-TRICHLOROBENZENE	ug/L								
1,2,4-TRICHLOROBENZENE	ug/L								
TRICHLOROETHYLENE (TCE)	ug/L	10	U	10	U	10	U	10	U
CHLOROFORM	ug/L	10	U	10	U	10	U	10	U
VINYL CHLORIDE	ug/L	10	U	10	U	10	U	10	U
XYLENES, TOTAL	ug/L	10	U	10	U	10	U	10	U
M,P-XYLENE (SUM OF ISOMERS)	ug/L	10	U	10	U	10	U	10	U
O-XYLENE (1,2-DIMETHYLBENZENE)	ug/L	10	U	10	U	10	U	10	U

Analytical Data Summary

	StationID	W6-SW04		W6-SW05		W6-SW06		W6-SW07	
	SampleID	NDA039		NDA040		NDA300		NDA301	
	Date Collected	04/13/00		04/13/00		04/13/00		04/13/00	
	SampleType	N		N		N		N	
Parameter	Units								
1,1,2,2-TETRACHLOROETHANE	ug/L	10	U	10	U	10	U	10	U
TETRACHLOROETHYLENE(PCE)	ug/L	10	U	10	U	10	U	10	U
STYRENE	ug/L	10	U	10	U	10	U	10	U
BROMOFORM	ug/L	10	U	10	U	10	U	10	U
tert-BUTYL METHYL ETHER	ug/L								
1,1,1-TRICHLOROETHANE	ug/L	10	U	10	U	10	U	10	U
1,1,2-TRICHLOROETHANE	ug/L	10	U	10	U	10	U	10	U
1,2,3-TRICHLOROBENZENE	ug/L								
1,2,4-TRICHLOROBENZENE	ug/L								
TRICHLOROETHYLENE (TCE)	ug/L	10	U	10	U	10	U	10	U
CHLOROFORM	ug/L	10	U	10	U	10	U	10	U
VINYL CHLORIDE	ug/L	10	U	10	U	10	U	10	U
XYLENES, TOTAL	ug/L	10	U	10	U	10	U	10	U
M,P-XYLENE (SUM OF ISOMERS)	ug/L	10	U	10	U	10	U	10	U
O-XYLENE (1,2-DIMETHYLBENZENE)	ug/L	10	U	10	U	10	U	10	U

Analytical Data Summary

	StationID	NDW06SW06		NDW06SW07		NDW06SW10		NDW06SW11	
	SampleID	NDW06SW06-R01		NDW06SW07-R01		NDW06SW10K-R01		NDW06SW11K-R01	
	Date Collected	09/29/03		09/29/03		09/29/03		09/29/03	
	SampleType	N		N		N		N	
Parameter	Units								
1,1,2,2-TETRACHLOROETHANE	ug/L	0.5	U	0.5	U	0.5	U	0.5	U
TETRACHLOROETHYLENE(PCE)	ug/L	0.5	U	0.5	U	0.5	U	0.5	U
STYRENE	ug/L	0.5	U	0.5	U	0.5	U	0.5	U
BROMOFORM	ug/L	0.5	U	0.5	U	0.5	U	0.5	U
tert-BUTYL METHYL ETHER	ug/L	0.5	U	0.5	U	0.5	U	0.5	U
1,1,1-TRICHLOROETHANE	ug/L	0.5	U	0.5	U	0.5	U	0.5	U
1,1,2-TRICHLOROETHANE	ug/L	0.5	U	0.5	U	0.5	U	0.5	U
1,2,3-TRICHLOROBENZENE	ug/L	0.5	R	0.5	R	0.5	R	0.5	R
1,2,4-TRICHLOROBENZENE	ug/L	0.5	U	0.5	U	0.5	U	0.5	U
TRICHLOROETHYLENE (TCE)	ug/L	0.5	U	0.5	U	0.5	U	0.5	U
CHLOROFORM	ug/L	0.5	U	0.5	U	0.5	U	0.5	U
VINYL CHLORIDE	ug/L	0.5	U	0.5	U	0.5	U	0.5	U
XYLENES, TOTAL	ug/L	2	U	2	U	2	U	2	U
M,P-XYLENE (SUM OF ISOMERS)	ug/L								
O-XYLENE (1,2-DIMETHYLBENZENE)	ug/L								

Analytical Data Summary

	StationID	NDW06SW02		NDW06SW02		NDW06SW03		NDW06SW05	
	SampleID	NDW06FD02P-R01		NDW06SW02-R01		NDW06SW03-R01		NDW06SW05-R01	
	Date Collected	10/01/03		10/01/03		10/01/03		10/01/03	
	SampleType	FD		N		N		N	
Parameter	Units								
1,1,2,2-TETRACHLOROETHANE	ug/L	0.5	U	0.5	U	0.5	U	0.5	U
TETRACHLOROETHYLENE(PCE)	ug/L	0.5	U	0.5	U	0.5	U	0.5	U
STYRENE	ug/L	0.5	U	0.5	U	0.5	U	0.5	U
BROMOFORM	ug/L	0.5	U	0.5	U	0.5	U	0.5	U
tert-BUTYL METHYL ETHER	ug/L	0.5	U	0.5	U	0.5	U	0.5	U
1,1,1-TRICHLOROETHANE	ug/L	0.5	U	0.5	U	0.5	U	0.5	U
1,1,2-TRICHLOROETHANE	ug/L	0.5	U	0.5	U	0.5	U	0.5	U
1,2,3-TRICHLOROBENZENE	ug/L	0.5	R	0.5	R	0.5	R	0.5	R
1,2,4-TRICHLOROBENZENE	ug/L	0.5	U	0.5	U	0.5	U	0.5	U
TRICHLOROETHYLENE (TCE)	ug/L	0.5	U	0.5	U	0.5	U	0.5	U
CHLOROFORM	ug/L	0.5	U	0.5	U	0.5	U	0.5	U
VINYL CHLORIDE	ug/L	0.5	U	0.5	U	0.5	U	0.5	U
XYLENES, TOTAL	ug/L	2	U	2	U	2	U	2	U
M,P-XYLENE (SUM OF ISOMERS)	ug/L								
O-XYLENE (1,2-DIMETHYLBENZENE)	ug/L								

Analytical Data Summary

	StationID	NDW06SW08		NDW06SW09	
	SampleID	NDW06SW08-R01		NDW06SW09-R01	
	Date Collected	10/01/03		10/01/03	
	SampleType	N		N	
Parameter	Units				
1,1,2,2-TETRACHLOROETHANE	ug/L	0.5	U	0.5	U
TETRACHLOROETHYLENE(PCE)	ug/L	0.5	U	0.5	U
STYRENE	ug/L	0.5	U	0.5	U
BROMOFORM	ug/L	0.5	U	0.5	U
tert-BUTYL METHYL ETHER	ug/L	0.5	U	0.5	U
1,1,1-TRICHLOROETHANE	ug/L	0.5	U	0.5	U
1,1,2-TRICHLOROETHANE	ug/L	0.5	U	0.5	U
1,2,3-TRICHLOROBENZENE	ug/L	0.5	R	0.5	R
1,2,4-TRICHLOROBENZENE	ug/L	0.5	U	0.5	U
TRICHLOROETHYLENE (TCE)	ug/L	0.5	U	0.5	U
CHLOROFORM	ug/L	0.5	U	0.5	U
VINYL CHLORIDE	ug/L	0.5	U	0.5	U
XYLENES, TOTAL	ug/L	2	U	2	U
M,P-XYLENE (SUM OF ISOMERS)	ug/L				
O-XYLENE (1,2-DIMETHYLBENZENE)	ug/L				

Sediment

Analytical Data Summary

	StationID	W6-SD01		W6-SD02		W6-SD03		W6-SD03	
	SampleID	NDA042		NDA043		NDA044		NDA307FD1	
	Date Collected	04/13/00		04/13/00		04/13/00		04/13/00	
	SampleType	N		N		N		FD	
Parameter	**Units**								
1,3-Dinitrobenzene	ug/Kg	389	U	368	U	1160	U	1080	U
2,4-Dinitrotoluene	ug/Kg	389	U	368	U	1160	U	1080	U
2,6-Dinitrotoluene	ug/Kg	389	U	368	U	1160	U	1080	U
Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine	ug/Kg	389	U	368	U	1160	U	1080	U
2-Nitrotoluene	ug/Kg	389	U	368	U	1160	U	1080	U
3-Nitrotoluene	ug/Kg	389	U	368	U	1160	U	1080	U
4-Nitrotoluene	ug/Kg	389	U	368	U	1160	U	1080	U
Nitrobenzene	ug/Kg	389	U	368	U	1160	U	1080	U
Hexahydro-1,3,5-trinitro-1,3,5,7-tetrazocine	ug/Kg	389	U	368	U	1160	U	1080	U
Tetryl	ug/Kg	389	U	368	U	1160	U	1080	U
1,3,5-Trinitrobenzene	ug/Kg	389	U	368	U	1160	U	1080	U
2,4,6-trinitrotoluene	ug/Kg	389	U	368	U	1160	U	1080	U

Analytical Data Summary

	StationID	W6-SD04		W6-SD05		W6-SD06		W6-SD07	
	SampleID	NDA045		NDA046		NDA302		NDA303	
	Date Collected	04/13/00		04/13/00		04/13/00		04/13/00	
	SampleType	N		N		N		N	
Parameter	**Units**								
1,3-Dinitrobenzene	ug/Kg	875	U	1010	U	618	U	1090	U
2,4-Dinitrotoluene	ug/Kg	875	U	1010	U	618	U	1090	U
2,6-Dinitrotoluene	ug/Kg	875	U	1010	U	618	U	1090	U
Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine	ug/Kg	875	U	1010	U	618	U	1090	U
2-Nitrotoluene	ug/Kg	875	U	1010	U	618	U	1090	U
3-Nitrotoluene	ug/Kg	875	U	1010	U	618	U	1090	U
4-Nitrotoluene	ug/Kg	875	U	1010	U	618	U	1090	U
Nitrobenzene	ug/Kg	875	U	1010	U	618	U	1090	U
Hexahydro-1,3,5-trinitro-1,3,5,7-tetrazocine	ug/Kg	875	U	1010	U	618	U	1090	U
Tetryl	ug/Kg	875	U	1010	U	618	U	1090	U
1,3,5-Trinitrobenzene	ug/Kg	875	U	1010	U	618	U	1090	U
2,4,6-trinitrotoluene	ug/Kg	875	U	1010	U	618	U	1090	U

Analytical Data Summary

	StationID	NDW06SD02		NDW06SD02		NDW06SD03		NDW06SD05	
	SampleID	NDW06FD03P-R01		NDW06SD02-R01		NDW06SD03-R01		NDW06SD05-R01	
	Date Collected	09/03/03		09/03/03		09/03/03		09/03/03	
	SampleType	FD		N		N		N	
Parameter	**Units**								
1,3-Dinitrobenzene	ug/Kg	169	U	184	U	288	U	398	U
2,4-Dinitrotoluene	ug/Kg	169	U	184	U	288	U	398	U
2,6-Dinitrotoluene	ug/Kg	169	U	184	U	288	U	398	U
Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine	ug/Kg	169	U	184	U	288	U	398	U
2-Nitrotoluene	ug/Kg	169	U	184	U	288	U	398	U
3-Nitrotoluene	ug/Kg	169	U	184	U	288	U	398	U
4-Nitrotoluene	ug/Kg	169	U	184	U	288	U	398	U
Nitrobenzene	ug/Kg	169	U	184	U	288	U	398	U
Hexahydro-1,3,5-trinitro-1,3,5,7-tetrazocine	ug/Kg	169	U	184	U	288	U	398	U
Tetryl	ug/Kg	169	UJ	184	UJ	288	UJ	398	UJ
1,3,5-Trinitrobenzene	ug/Kg	169	U	184	U	288	U	398	U
2,4,6-trinitrotoluene	ug/Kg	169	U	184	U	288	U	398	U

Analytical Data Summary

	StationID	NDW06SD11		NDW06SD13		NDW06SD14		NDW06SD06	
	SampleID	NDW06SD11-R01		NDW06SD13-R01		NDW06SD14-R01		NDW06SD06-R01	
	Date Collected	09/03/03		09/03/03		09/03/03		09/04/03	
	SampleType	N		N		N		N	
Parameter	**Units**								
1,3-Dinitrobenzene	ug/Kg	171	U	164	U	184	U	305	U
2,4-Dinitrotoluene	ug/Kg	171	U	164	U	184	U	305	U
2,6-Dinitrotoluene	ug/Kg	171	U	164	U	184	U	305	U
Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine	ug/Kg	171	U	164	U	184	U	305	U
2-Nitrotoluene	ug/Kg	171	U	164	U	184	U	305	U
3-Nitrotoluene	ug/Kg	171	U	164	U	184	U	305	U
4-Nitrotoluene	ug/Kg	171	U	164	U	184	U	305	U
Nitrobenzene	ug/Kg	171	U	164	U	184	U	305	U
Hexahydro-1,3,5-trinitro-1,3,5,7-tetrazocine	ug/Kg	171	U	164	U	184	U	305	U
Tetryl	ug/Kg	171	UJ	164	UJ	184	UJ	305	UJ
1,3,5-Trinitrobenzene	ug/Kg	171	U	164	U	184	U	305	U
2,4,6-trinitrotoluene	ug/Kg	171	U	164	U	184	U	305	U

Analytical Data Summary

	StationID	NDW06SD07		NDW06SD08		NDW06SD09		NDW06SD10	
	SampleID	NDW06SD07-R01		NDW06SD08-R01		NDW06SD09-R01		NDW06SD10-R01	
	Date Collected	09/04/03		09/04/03		09/04/03		09/04/03	
	SampleType	N		N		N		N	
Parameter	**Units**								
1,3-Dinitrobenzene	ug/Kg	403	U	404	U	338	U	157	U
2,4-Dinitrotoluene	ug/Kg	403	U	404	U	338	U	157	U
2,6-Dinitrotoluene	ug/Kg	403	U	404	U	338	U	157	U
Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine	ug/Kg	403	U	404	U	338	U	157	U
2-Nitrotoluene	ug/Kg	403	U	404	U	338	U	157	U
3-Nitrotoluene	ug/Kg	403	U	404	U	338	U	157	U
4-Nitrotoluene	ug/Kg	403	U	404	U	338	U	157	U
Nitrobenzene	ug/Kg	403	U	404	U	338	U	157	U
Hexahydro-1,3,5-trinitro-1,3,5,7-tetrazocine	ug/Kg	403	U	404	U	338	U	157	U
Tetryl	ug/Kg	403	UJ	404	UJ	338	UJ	157	UJ
1,3,5-Trinitrobenzene	ug/Kg	403	U	404	U	338	U	157	U
2,4,6-trinitrotoluene	ug/Kg	403	U	404	U	338	U	157	U

Analytical Data Summary

	StationID	NDW06SD12		NDW06SD15		NDW06SD16	
	SampleID	NDW06SD12-R01		NDW06SD15K-R01		NDW06SD16K-R01	
	Date Collected	09/04/03		09/05/03		09/05/03	
	SampleType	N		N		N	
Parameter	**Units**						
1,3-Dinitrobenzene	ug/Kg	196	U	304	U	311	U
2,4-Dinitrotoluene	ug/Kg	196	U	304	U	311	U
2,6-Dinitrotoluene	ug/Kg	196	U	304	U	311	U
Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine	ug/Kg	196	U	304	U	311	U
2-Nitrotoluene	ug/Kg	196	U	304	U	311	U
3-Nitrotoluene	ug/Kg	196	U	304	U	311	U
4-Nitrotoluene	ug/Kg	196	U	304	U	311	U
Nitrobenzene	ug/Kg	196	U	304	U	311	U
Hexahydro-1,3,5-trinitro-1,3,5,7-tetrazocine	ug/Kg	196	U	304	U	311	U
Tetryl	ug/Kg	196	UJ	304	UJ	311	UJ
1,3,5-Trinitrobenzene	ug/Kg	196	U	304	U	311	U
2,4,6-trinitrotoluene	ug/Kg	196	U	304	U	311	U

Analytical Data Summary

	StationID	W6-SD01		W6-SD02		W6-SD03		W6-SD03		W6-SD04	
	SampleID	NDA042		NDA043		NDA044		NDA307FD1		NDA045	
	Date Collected	04/13/00		04/13/00		04/13/00		04/13/00		04/13/00	
	SampleType	N		N		N		FD		N	
Parameter	Units										
Aluminum	mg/Kg	8400	=	6890	=	19300	=	16900	=	12300	=
Antimony	mg/Kg	0.72	J	97.8	J	0.85	J	0.66	UJ	0.5	UJ
Arsenic	mg/Kg	2.3	J	555	=	5.9	J	3.7	J	5.8	J
Barium	mg/Kg	5.1	J	571	=	14.7	J	12.9	J	10.7	J
Beryllium	mg/Kg	0.082	J	14.2	=	0.25	J	0.19	J	0.18	J
Cadmium	mg/Kg	0.033	U	13.7	=	0.094	U	0.095	U	0.072	U
Calcium	mg/Kg	30100	=	55800	=	46100	=	25800	=	38600	=
Chromium, Total	mg/Kg	32.4	=	67.8	=	16.9	=	15.3	=	13.9	=
Cobalt	mg/Kg	6.2	J	142	=	6.9	J	7	J	6.1	J
Copper	mg/Kg	22.8	=	101	=	37.8	=	39.5	=	29.8	=
Iron	mg/Kg	13100	=	10500	=	25700	=	25200	=	21900	=
Lead	mg/Kg	3.1	=	144	=	21.8	=	31.4	=	13.8	=
Magnesium	mg/Kg	6340	=	5260	=	11600	=	10700	=	8590	=
Manganese	mg/Kg	133	=	277	=	237	=	240	=	226	=
Mercury	mg/Kg	0.18	J	0.21	J	0.05	UJ	0.048	UJ	0.052	UJ
Nickel	mg/Kg	12.6	J	143	=	6.1	J	5.7	J	4.9	J
Potassium	mg/Kg	1930	=	1290	J	6550	=	6100	=	4530	=
Selenium	mg/Kg	0.35	U	544	=	2.2	J	1.8	J	0.96	J
Silver	mg/Kg	0.083	U	14.5	=	0.24	U	0.24	U	0.18	U
Sodium	mg/Kg	11100	=	7190	=	45700	=	44600	=	32200	=
Thallium	mg/Kg	0.45	U	572	=	1.4	J	1.3	U	0.97	U
Vanadium	mg/Kg	30.5	=	174	=	50.9	=	45.7	J	35	J
Zinc	mg/Kg	26.1	=	173	=	67.5	=	77.1	=	60.5	=

Analytical Data Summary

	StationID	W6-SD05		W6-SD06		W6-SD07		NDW06SD02		NDW06SD02	
	SampleID	NDA046		NDA302		NDA303		NDW06FD03P-R01		NDW06SD02-R01	
	Date Collected	04/13/00		04/13/00		04/13/00		09/03/03		09/03/03	
	SampleType	N		N		N		FD		N	
Parameter	Units										
Aluminum	mg/Kg	14800	=	5680	=	17800	=	1650	=	1810	=
Antimony	mg/Kg	0.56	UJ	0.14	UJ	0.62	UJ	0.513	J	0.645	J
Arsenic	mg/Kg	5.2	J	1.1	J	4	J	1.25	J	1.33	J
Barium	mg/Kg	11.9	J	17.3	J	14.4	J	4.42	J	4.48	J
Beryllium	mg/Kg	0.25	J	0.16	J	0.29	J	0.0448	J	0.0433	J
Cadmium	mg/Kg	0.081	U	0.02	U	0.088	U	0.0153	U	0.0161	U
Calcium	mg/Kg	30100	=	1630	=	14600	=	136000	=	115000	=
Chromium, Total	mg/Kg	15.6	=	4.6	=	12.9	=	1.82	J	1.99	J
Cobalt	mg/Kg	6.5	J	1.7	J	7.3	J	0.746	J	0.917	J
Copper	mg/Kg	34.4	=	9.1	=	28.9	=	2.85	J	2.87	J
Iron	mg/Kg	23900	=	5110	=	22400	=	2280	=	2640	=
Lead	mg/Kg	14.2	=	1.5	=	8.3	=	0.519	J	0.741	=
Magnesium	mg/Kg	9710	=	2670	=	9840	=	2150	=	2510	=
Manganese	mg/Kg	237	=	30.2	=	225	=	30.9	=	41.1	=
Mercury	mg/Kg	0.047	UJ	0.0087	UJ	0.052	UJ	0.00237	J	0.00265	J
Nickel	mg/Kg	5.4	J	1.8	J	4.8	J	0.623	J	0.666	J
Potassium	mg/Kg	5540	=	2070	=	6250	=	851	J	857	J
Selenium	mg/Kg	1.3	J	0.8	J	1.4	J	0.24	U	0.252	U
Silver	mg/Kg	0.2	U	0.05	U	0.22	U	0.029	U	0.0306	U
Sodium	mg/Kg	38600	=	8900	=	41000	=	6500	=	6640	=
Thallium	mg/Kg	1.1	U	0.27	U	1.2	U	0.147	U	0.154	U
Vanadium	mg/Kg	40.1	J	23.5	=	45.7	=	5.43	J	6.51	J
Zinc	mg/Kg	59.2	=	12.9	=	53.2	=	4.42	R	5.08	R

Analytical Data Summary

	StationID	NDW06SD03		NDW06SD05		NDW06SD06		NDW06SD07		NDW06SD08	
	SampleID	NDW06SD03-R01		NDW06SD05-R01		NDW06SD06-R01		NDW06SD07-R01		NDW06SD08-R01	
	Date Collected	09/03/03		09/03/03		09/04/03		09/04/03		09/04/03	
	SampleType	N		N		N		N		N	
Parameter	Units										
Aluminum	mg/Kg	10800	J	12400	J	6260	J	12700	J	10300	J
Antimony	mg/Kg	0.571	J	0.307	J	0.312	J	0.766	J	0.602	J
Arsenic	mg/Kg	1.91	J	5.07	J	4.95	J	8.78	J	13.5	J
Barium	mg/Kg	8.65	J	9.47	J	7.69	J	13.3	J	9.99	J
Beryllium	mg/Kg	0.202	J	0.306	J	0.252	J	0.517	J	0.393	J
Cadmium	mg/Kg	0.0629	J	0.558	J	0.0465	J	0.109	J	0.131	J
Calcium	mg/Kg	72500	J	22600	J	19400	J	64900	J	53600	J
Chromium, Total	mg/Kg	7.54	J	14	J	6.11	J	11	J	10.4	J
Cobalt	mg/Kg	3.31	J	5.69	J	7.58	J	10.4	J	12.2	J
Copper	mg/Kg	14.4	J	29.8	J	13.3	J	26.4	J	22	J
Iron	mg/Kg	12200	J	23300	J	12400	J	22600	J	24400	J
Lead	mg/Kg	5.11	J	21.5	J	4.33	J	9.47	J	9.11	J
Magnesium	mg/Kg	5350	J	7560	J	4900	J	8570	J	7870	J
Manganese	mg/Kg	106	J	228	J	124	J	352	J	388	J
Mercury	mg/Kg	0.0256	J	0.0644	J	0.0488	J	0.119	J	0.11	J
Nickel	mg/Kg	3.08	J	5.47	J	3.61	J	5.96	J	5.36	J
Potassium	mg/Kg	3120	J	3830	J	2310	J	4200	J	3870	J
Selenium	mg/Kg	0.802	J	1.13	J	0.794	J	1.05	J	1.06	J
Silver	mg/Kg	0.0505	UJ	0.102	J	0.0525	UJ	0.0738	UJ	0.136	J
Sodium	mg/Kg	18500	J	26300	J	18300	J	29100	J	29200	J
Thallium	mg/Kg	0.255	UJ	1.01	J	0.265	UJ	0.373	UJ	0.873	J
Vanadium	mg/Kg	21.9	J	34.3	J	28.4	J	47.8	J	45.9	J
Zinc	mg/Kg	27.5	R	61.6	J	25.7	J	47	J	47.4	J

Analytical Data Summary

	StationID	NDW06SD09		NDW06SD10		NDW06SD11		NDW06SD12		NDW06SD13	
	SampleID	NDW06SD09-R01		NDW06SD10-R01		NDW06SD11-R01		NDW06SD12-R01		NDW06SD13-R01	
	Date Collected	09/04/03		09/04/03		09/03/03		09/04/03		09/03/03	
	SampleType	N		N		N		N		N	
Parameter	Units										
Aluminum	mg/Kg	7890	J	3020	=	2340	=	5360	=	4630	=
Antimony	mg/Kg	0.871	J	0.933	J	0.585	J	0.564	J	0.538	J
Arsenic	mg/Kg	6.35	J	2.56	=	1.51	J	2.64	=	1.85	J
Barium	mg/Kg	8.55	J	8.86	J	6.07	J	6.03	J	5.8	J
Beryllium	mg/Kg	0.267	J	0.0563	J	0.0417	J	0.105	J	0.0691	J
Cadmium	mg/Kg	0.111	J	0.424	J	0.0351	J	0.0503	J	0.0252	J
Calcium	mg/Kg	71000	J	107000	=	127000	=	99600	=	98500	=
Chromium, Total	mg/Kg	7.88	J	18.9	=	2.72	=	6.11	=	7.94	=
Cobalt	mg/Kg	5.96	J	1.86	J	1.29	J	2.65	J	2.48	J
Copper	mg/Kg	16.8	J	82.4	=	41.5	=	37.4	=	13.9	=
Iron	mg/Kg	15000	J	11100	=	3750	=	7510	=	7590	=
Lead	mg/Kg	5.03	J	95.5	=	0.468	J	3.19	=	16.9	=
Magnesium	mg/Kg	6100	J	3050	=	2310	=	4210	=	3270	=
Manganese	mg/Kg	220	J	107	=	47.2	=	90.7	=	82.7	=
Mercury	mg/Kg	0.0709	J	0.013	J	0.00468	J	0.0163	J	0.00861	J
Nickel	mg/Kg	3.62	J	10.5	=	1.07	J	2.53	J	2.84	J
Potassium	mg/Kg	2740	J	822	J	861	J	1540	=	1220	=
Selenium	mg/Kg	1.06	J	0.237	U	0.252	J	0.269	U	0.259	J
Silver	mg/Kg	0.062	UJ	0.0287	U	0.0304	U	0.0326	U	0.0386	J
Sodium	mg/Kg	21900	J	6020	=	5710	=	8820	=	6520	=
Thallium	mg/Kg	0.586	J	0.145	U	0.153	U	0.165	U	0.144	U
Vanadium	mg/Kg	31	J	11.4	=	8.77	J	14.5	=	14.7	=
Zinc	mg/Kg	41.5	J	241	=	5.9	R	21.1	=	29.7	R

Analytical Data Summary

	StationID	NDW06SD14		NDW06SD15		NDW06SD16	
	SampleID	NDW06SD14-R01		NDW06SD15K-R01		NDW06SD16K-R01	
	Date Collected	09/03/03		09/05/03		09/05/03	
	SampleType	N		N		N	
Parameter	Units						
Aluminum	mg/Kg	3860	=	4520	J	1950	J
Antimony	mg/Kg	0.68	J	0.216	UJ	0.951	J
Arsenic	mg/Kg	1.86	J	0.712	J	1.49	J
Barium	mg/Kg	6.08	J	4.24	J	3.88	J
Beryllium	mg/Kg	0.0696	J	0.124	J	0.055	J
Cadmium	mg/Kg	0.0262	J	0.128	J	0.0818	J
Calcium	mg/Kg	135000	=	5540	J	74900	J
Chromium, Total	mg/Kg	3.16	=	5.24	J	4.91	J
Cobalt	mg/Kg	1.43	J	2.35	J	1.26	J
Copper	mg/Kg	5.57	J	10.6	J	6.26	J
Iron	mg/Kg	4480	=	5620	J	3640	J
Lead	mg/Kg	0.838	=	3.07	J	0.51	J
Magnesium	mg/Kg	2630	=	6050	J	6980	J
Manganese	mg/Kg	45.3	=	53.3	J	67	J
Mercury	mg/Kg	0.00812	J	0.0383	J	0.0192	J
Nickel	mg/Kg	1.4	J	2.68	J	1.97	J
Potassium	mg/Kg	1330	=	2100	J	2040	J
Selenium	mg/Kg	0.261	U	0.452	UJ	0.595	J
Silver	mg/Kg	0.0316	U	0.0547	UJ	0.054	UJ
Sodium	mg/Kg	8900	=	23000	J	31400	J
Thallium	mg/Kg	0.16	U	0.284	J	0.273	UJ
Vanadium	mg/Kg	9.3	J	20.1	J	8.22	J
Zinc	mg/Kg	8.54	R	18.6	J	7.99	J

Analytical Data Summary

	StationID	NDW06SD02		NDW06SD02		NDW06SD03		NDW06SD05		NDW06SD11	
	SampleID	NDW06FD03P-R01		NDW06SD02-R01		NDW06SD03-R01		NDW06SD05-R01		NDW06SD11-R01	
	Date Collected	09/03/03		09/03/03		09/03/03		09/03/03		09/03/03	
	SampleType	FD		N		N		N		N	
Parameter	Units										
Perchlorate	ug/Kg	146	U	143	U	236	U	336	U	131	U

Analytical Data Summary

	StationID	NDW06SD13		NDW06SD14		NDW06SD06		NDW06SD07		NDW06SD08	
	SampleID	NDW06SD13-R01		NDW06SD14-R01		NDW06SD06-R01		NDW06SD07-R01		NDW06SD08-R01	
	Date Collected	09/03/03		09/03/03		09/04/03		09/04/03		09/04/03	
	SampleType	N		N		N		N		N	
Parameter	Units										
Perchlorate	ug/Kg	138	U	162	U	227	U	350	U	314	U

Analytical Data Summary

	StationID	NDW06SD09		NDW06SD10		NDW06SD12		NDW06SD15		NDW06SD16	
	SampleID	NDW06SD09-R01		NDW06SD10-R01		NDW06SD12-R01		NDW06SD15K-R01		NDW06SD16K-R01	
	Date Collected	09/04/03		09/04/03		09/04/03		09/05/03		09/05/03	
	SampleType	N		N		N		N		N	
Parameter	**Units**										
Perchlorate	ug/Kg	264	U	138	U	162	U	241	U	396	U

Analytical Data Summary

	StationID	W6-SD01		W6-SD02		W6-SD03		W6-SD03		W6-SD04	
	SampleID	NDA042		NDA043		NDA044		NDA307FD1		NDA045	
	Date Collected	04/13/00		04/13/00		04/13/00		04/13/00		04/13/00	
	SampleType	N		N		N		FD		N	
Parameter	Units										
Aroclor-1016	ug/Kg	55	U	48	U	156	UJ	156	UJ	117	UJ
Aroclor-1221	ug/Kg	111	U	98	U	315	UJ	316	UJ	238	UJ
Aroclor-1232	ug/Kg	55	U	48	U	156	UJ	156	UJ	117	UJ
Aroclor-1242	ug/Kg	55	U	48	U	156	UJ	156	UJ	117	UJ
Aroclor-1248	ug/Kg	55	U	48	U	156	UJ	156	UJ	117	UJ
Aroclor-1254	ug/Kg	55	U	48	U	156	UJ	156	UJ	117	UJ
Aroclor-1260	ug/Kg	55	U	48	U	156	UJ	156	UJ	117	UJ

Analytical Data Summary

	StationID	W6-SD05		W6-SD06		W6-SD07		NDW06SD02		NDW06SD02	
	SampleID	NDA046		NDA302		NDA303		NDW06FD03P-R01		NDW06SD02-R01	
	Date Collected	04/13/00		04/13/00		04/13/00		09/03/03		09/03/03	
	SampleType	N		N		N		FD		N	
Parameter	Units										
Aroclor-1016	ug/Kg	132	UJ	83	UJ	146	UJ	45	U	49	U
Aroclor-1221	ug/Kg	268	UJ	168	UJ	296	UJ	91	U	99	U
Aroclor-1232	ug/Kg	132	UJ	83	UJ	146	UJ	45	U	49	U
Aroclor-1242	ug/Kg	132	UJ	83	UJ	146	UJ	45	U	49	U
Aroclor-1248	ug/Kg	132	UJ	83	UJ	146	UJ	45	U	49	U
Aroclor-1254	ug/Kg	132	UJ	83	UJ	146	UJ	45	U	49	U
Aroclor-1260	ug/Kg	132	UJ	83	UJ	146	UJ	45	U	49	U

Analytical Data Summary

	StationID	NDW06SD03		NDW06SD05		NDW06SD11		NDW06SD13		NDW06SD14	
	SampleID	NDW06SD03-R01		NDW06SD05-R01		NDW06SD11-R01		NDW06SD13-R01		NDW06SD14-R01	
	Date Collected	09/03/03		09/03/03		09/03/03		09/03/03		09/03/03	
	SampleType	N		N		N		N		N	
Parameter	Units										
Aroclor-1016	ug/Kg	76	U	100	U	45	U	43	U	50	U
Aroclor-1221	ug/Kg	150	U	210	U	91	U	88	U	100	U
Aroclor-1232	ug/Kg	76	U	100	U	45	U	43	U	50	U
Aroclor-1242	ug/Kg	76	U	100	U	45	U	43	U	50	U
Aroclor-1248	ug/Kg	76	U	100	U	45	U	43	U	50	U
Aroclor-1254	ug/Kg	76	U	100	U	45	U	43	U	50	U
Aroclor-1260	ug/Kg	76	U	100	U	45	U	43	U	50	U

Analytical Data Summary

	StationID	NDW06SD06		NDW06SD07		NDW06SD08		NDW06SD09		NDW06SD10	
	SampleID	NDW06SD06-R01		NDW06SD07-R01		NDW06SD08-R01		NDW06SD09-R01		NDW06SD10-R01	
	Date Collected	09/04/03		09/04/03		09/04/03		09/04/03		09/04/03	
	SampleType	N		N		N		N		N	
Parameter	Units										
Aroclor-1016	ug/Kg	80	U	110	UJ	110	UJ	89	U	41	U
Aroclor-1221	ug/Kg	160	U	220	UJ	220	U	180	U	83	U
Aroclor-1232	ug/Kg	80	U	110	UJ	110	U	89	U	41	U
Aroclor-1242	ug/Kg	80	U	110	UJ	110	U	89	U	41	U
Aroclor-1248	ug/Kg	80	U	110	UJ	110	U	89	U	41	U
Aroclor-1254	ug/Kg	80	U	110	UJ	110	U	89	U	41	U
Aroclor-1260	ug/Kg	80	U	110	UJ	110	UJ	89	U	41	U

Analytical Data Summary

	StationID	NDW06SD12		NDW06SD15		NDW06SD16	
	SampleID	NDW06SD12-R01		NDW06SD15K-R01		NDW06SD16K-R01	
	Date Collected	09/04/03		09/05/03		09/05/03	
	SampleType	N		N		N	
Parameter	Units						
Aroclor-1016	ug/Kg	52	U	80	U	82	U
Aroclor-1221	ug/Kg	100	U	160	U	170	U
Aroclor-1232	ug/Kg	52	U	80	U	82	U
Aroclor-1242	ug/Kg	52	U	80	U	82	U
Aroclor-1248	ug/Kg	52	U	80	U	82	U
Aroclor-1254	ug/Kg	52	U	80	U	82	U
Aroclor-1260	ug/Kg	52	U	80	U	82	U

Analytical Data Summary

	StationID	W6-SD01		W6-SD02		W6-SD03		W6-SD03	
	SampleID	NDA042		NDA043		NDA044		NDA307FD1	
	Date Collected	04/13/00		04/13/00		04/13/00		04/13/00	
	SampleType	N		N		N		FD	
Parameter	Units								
Aldrin	ug/Kg	2.8	U	2.5	U	8	UJ	8	UJ
Alpha bhc (alpha hexachlorocyclohexane)	ug/Kg	2.8	U	2.5	U	8	UJ	8	UJ
Beta bhc (beta hexachlorocyclohexane)	ug/Kg	2.8	U	2.5	U	8	UJ	8	UJ
Delta bhc (delta hexachlorocyclohexane)	ug/Kg	2.8	U	2.5	U	8	UJ	8	UJ
Gamma bhc (lindane)	ug/Kg	2.8	U	2.5	U	8	UJ	8	UJ
Alpha-chlordane	ug/Kg	2.8	U	2.5	U	8	UJ	8	UJ
Gamma-chlordane	ug/Kg	2.8	U	2.5	U	8	UJ	8	UJ
p,p'-DDD	ug/Kg	5.5	U	4.9	U	16	UJ	16	UJ
p,p'-DDE	ug/Kg	5.5	U	0.81	J	16	UJ	16	UJ
p,p'-DDT	ug/Kg	5.5	U	4.9	U	16	UJ	16	UJ
Dieldrin	ug/Kg	5.5	U	4.9	U	16	UJ	16	UJ
Alpha endosulfan	ug/Kg	2.8	U	2.5	U	8	UJ	8	UJ
Beta endosulfan	ug/Kg	5.5	U	4.9	U	16	UJ	16	UJ
Endosulfan sulfate	ug/Kg	5.5	U	4.9	U	16	UJ	16	UJ
Endrin	ug/Kg	5.5	U	4.9	U	16	UJ	16	UJ
Endrin aldehyde	ug/Kg	5.5	U	4.9	U	16	UJ	16	UJ
Endrin ketone	ug/Kg	5.5	U	4.9	U	16	UJ	16	UJ
Heptachlor epoxide	ug/Kg	2.8	U	2.5	U	8	UJ	8	UJ
Heptachlor	ug/Kg	2.8	U	2.5	U	8	UJ	8	UJ
Methoxychlor	ug/Kg	28	U	25	U	80	UJ	80	UJ
Toxaphene	ug/Kg	283	U	249	U	801	UJ	802	UJ

Analytical Data Summary

	StationID	W6-SD04		W6-SD05		W6-SD06		W6-SD07	
	SampleID	NDA045		NDA046		NDA302		NDA303	
	Date Collected	04/13/00		04/13/00		04/13/00		04/13/00	
	SampleType	N		N		N		N	
Parameter	Units								
Aldrin	ug/Kg	6	UJ	6.8	UJ	4.3	UJ	7.5	UJ
Alpha bhc (alpha hexachlorocyclohexane)	ug/Kg	6	UJ	6.8	UJ	4.3	UJ	7.5	UJ
Beta bhc (beta hexachlorocyclohexane)	ug/Kg	6	UJ	6.8	UJ	4.3	UJ	7.5	UJ
Delta bhc (delta hexachlorocyclohexane)	ug/Kg	6	UJ	6.8	UJ	4.3	UJ	7.5	UJ
Gamma bhc (lindane)	ug/Kg	6	UJ	6.8	UJ	4.3	UJ	7.5	UJ
Alpha-chlordane	ug/Kg	6	UJ	6.8	UJ	4.3	UJ	7.5	UJ
Gamma-chlordane	ug/Kg	6	UJ	6.8	UJ	4.3	UJ	7.5	UJ
p,p'-DDD	ug/Kg	12	UJ	13	UJ	8.3	UJ	15	UJ
p,p'-DDE	ug/Kg	12	UJ	13	UJ	8.3	UJ	15	UJ
p,p'-DDT	ug/Kg	12	UJ	13	UJ	8.3	UJ	15	UJ
Dieldrin	ug/Kg	12	UJ	13	UJ	8.3	UJ	15	UJ
Alpha endosulfan	ug/Kg	6	UJ	6.8	UJ	4.3	UJ	7.5	UJ
Beta endosulfan	ug/Kg	12	UJ	13	UJ	8.3	UJ	15	UJ
Endosulfan sulfate	ug/Kg	12	UJ	13	UJ	8.3	UJ	15	UJ
Endrin	ug/Kg	12	UJ	13	UJ	8.3	UJ	15	UJ
Endrin aldehyde	ug/Kg	12	UJ	13	UJ	8.3	UJ	15	UJ
Endrin ketone	ug/Kg	12	UJ	13	UJ	8.3	UJ	15	UJ
Heptachlor epoxide	ug/Kg	6	UJ	6.8	UJ	4.3	UJ	7.5	UJ
Heptachlor	ug/Kg	6	UJ	6.8	UJ	4.3	UJ	7.5	UJ
Methoxychlor	ug/Kg	60	UJ	68	UJ	43	UJ	75	UJ
Toxaphene	ug/Kg	603	UJ	681	UJ	426	UJ	751	UJ

Analytical Data Summary

	StationID	NDW06SD02		NDW06SD02		NDW06SD02		NDW06SD03	
	SampleID	NDW06FD03P-R01		NDW06FD03P-R01DL1		NDW06SD02-R01		NDW06SD03-R01	
	Date Collected	09/03/03		09/03/03		09/03/03		09/03/03	
	SampleType	FD		LR		N		N	
Parameter	Units								
Aldrin	ug/Kg	2.3	R	23	R	2.5	UJ	3.9	UJ
Alpha bhc (alpha hexachlorocyclohexane)	ug/Kg	2.3	R	23	R	2.5	UJ	3.9	UJ
Beta bhc (beta hexachlorocyclohexane)	ug/Kg	2.3	R	23	R	2.5	U	3.9	U
Delta bhc (delta hexachlorocyclohexane)	ug/Kg	2.3	R	23	R	2.5	U	3.9	U
Gamma bhc (lindane)	ug/Kg	2.3	R	23	R	2.5	U	3.9	U
Alpha-chlordane	ug/Kg	2.3	R	23	R	2.5	U	3.9	U
Gamma-chlordane	ug/Kg	2.3	R	23	R	2.5	U	3.9	U
p,p'-DDD	ug/Kg	0.89	J	45	R	4.9	U	7.6	U
p,p'-DDE	ug/Kg	0.35	R	45	R	4.9	U	7.6	U
p,p'-DDT	ug/Kg	4.5	R	45	R	4.9	U	7.6	U
Dieldrin	ug/Kg	4.5	R	45	R	4.9	U	7.6	U
Alpha endosulfan	ug/Kg	2.3	R	23	R	2.5	U	3.9	U
Beta endosulfan	ug/Kg	4.5	R	45	R	4.9	U	7.6	U
Endosulfan sulfate	ug/Kg	4.5	R	45	R	4.9	U	7.6	U
Endrin	ug/Kg	4.5	R	45	R	4.9	UJ	7.6	UJ
Endrin aldehyde	ug/Kg	4.5	R	45	R	4.9	U	7.6	U
Endrin ketone	ug/Kg	4.5	R	45	R	4.9	U	7.6	U
Heptachlor epoxide	ug/Kg	2.3	R	23	R	2.5	U	3.9	U
Heptachlor	ug/Kg	2.3	R	23	R	2.5	U	3.9	U
Methoxychlor	ug/Kg	23	R	230	R	25	U	39	U
Toxaphene	ug/Kg	230	R	2300	R	250	UJ	390	UJ

Analytical Data Summary

	StationID	NDW06SD05		NDW06SD11		NDW06SD13		NDW06SD14	
	SampleID	NDW06SD05-R01		NDW06SD11-R01		NDW06SD13-R01		NDW06SD14-R01	
	Date Collected	09/03/03		09/03/03		09/03/03		09/03/03	
	SampleType	N		N		N		N	
Parameter	**Units**								
Aldrin	ug/Kg	54	UJ	2.3	UJ	2.2	UJ	2.6	R
Alpha bhc (alpha hexachlorocyclohexane)	ug/Kg	54	UJ	2.3	UJ	2.2	UJ	2.6	R
Beta bhc (beta hexachlorocyclohexane)	ug/Kg	54	U	2.3	U	2.2	U	2.6	R
Delta bhc (delta hexachlorocyclohexane)	ug/Kg	54	U	2.3	U	2.2	U	2.6	R
Gamma bhc (lindane)	ug/Kg	54	U	2.3	U	2.2	U	2.6	R
Alpha-chlordane	ug/Kg	54	U	2.3	U	2.2	U	2.6	R
Gamma-chlordane	ug/Kg	54	U	2.3	U	2.2	U	2.6	R
p,p'-DDD	ug/Kg	100	U	1.2	J	670	J	0.26	J
p,p'-DDE	ug/Kg	100	U	1.5	J	410	J	5	R
p,p'-DDT	ug/Kg	8.6	J	4.5	U	4.3	U	0.35	J
Dieldrin	ug/Kg	100	U	4.5	U	4.3	U	5	R
Alpha endosulfan	ug/Kg	54	U	2.3	U	2.2	U	2.6	R
Beta endosulfan	ug/Kg	100	U	4.5	U	4.3	U	5	R
Endosulfan sulfate	ug/Kg	100	U	4.5	U	4.3	U	5	R
Endrin	ug/Kg	100	UJ	4.5	UJ	4.3	UJ	5	R
Endrin aldehyde	ug/Kg	100	U	4.5	U	4.3	U	5	R
Endrin ketone	ug/Kg	100	U	4.5	U	4.3	U	5	R
Heptachlor epoxide	ug/Kg	54	U	2.3	U	2.2	U	2.6	R
Heptachlor	ug/Kg	54	U	2.3	U	2.2	U	2.6	R
Methoxychlor	ug/Kg	540	U	23	U	22	U	26	R
Toxaphene	ug/Kg	5400	UJ	230	UJ	220	UJ	260	R

Analytical Data Summary

	StationID	NDW06SD14		NDW06SD06		NDW06SD07		NDW06SD08	
	SampleID	NDW06SD14-R01DL1		NDW06SD06-R01		NDW06SD07-R01		NDW06SD08-R01	
	Date Collected	09/03/03		09/04/03		09/04/03		09/04/03	
	SampleType	LR		N		N		N	
Parameter	Units								
Aldrin	ug/Kg	26	R	4.1	UJ	5.5	R	5.5	U
Alpha bhc (alpha hexachlorocyclohexane)	ug/Kg	26	R	4.1	UJ	5.5	R	5.5	U
Beta bhc (beta hexachlorocyclohexane)	ug/Kg	26	R	4.1	UJ	5.5	R	5.5	U
Delta bhc (delta hexachlorocyclohexane)	ug/Kg	26	R	4.1	UJ	5.5	R	5.5	U
Gamma bhc (lindane)	ug/Kg	26	R	4.1	UJ	5.5	R	5.5	U
Alpha-chlordane	ug/Kg	26	R	4.1	UJ	5.5	R	5.5	U
Gamma-chlordane	ug/Kg	26	R	4.1	UJ	5.5	R	5.5	U
p,p'-DDD	ug/Kg	50	R	8	UJ	11	R	2.3	J
p,p'-DDE	ug/Kg	50	R	8	UJ	11	R	11	U
p,p'-DDT	ug/Kg	50	R	8	UJ	11	R	11	U
Dieldrin	ug/Kg	50	R	8	UJ	11	R	11	U
Alpha endosulfan	ug/Kg	26	R	4.1	UJ	5.5	R	5.5	U
Beta endosulfan	ug/Kg	50	R	8	UJ	11	R	11	U
Endosulfan sulfate	ug/Kg	50	R	8	UJ	11	R	11	U
Endrin	ug/Kg	50	R	8	UJ	11	R	11	U
Endrin aldehyde	ug/Kg	50	R	8	UJ	11	R	11	U
Endrin ketone	ug/Kg	50	R	8	UJ	11	R	11	U
Heptachlor epoxide	ug/Kg	26	R	4.1	UJ	5.5	R	5.5	U
Heptachlor	ug/Kg	26	R	4.1	UJ	5.5	R	5.5	U
Methoxychlor	ug/Kg	260	R	41	UJ	55	R	55	U
Toxaphene	ug/Kg	2600	R	410	UJ	550	R	550	U

Analytical Data Summary

	StationID	NDW06SD09		NDW06SD10		NDW06SD12		NDW06SD15	
	SampleID	NDW06SD09-R01		NDW06SD10-R01		NDW06SD12-R01		NDW06SD15K-R01	
	Date Collected	09/04/03		09/04/03		09/04/03		09/05/03	
	SampleType	N		N		N		N	
Parameter	Units								
Aldrin	ug/Kg	4.6	U	2.1	U	2.6	U	4.1	UJ
Alpha bhc (alpha hexachlorocyclohexane)	ug/Kg	4.6	U	2.1	U	2.6	U	4.1	U
Beta bhc (beta hexachlorocyclohexane)	ug/Kg	4.6	U	2.1	U	2.6	U	4.1	U
Delta bhc (delta hexachlorocyclohexane)	ug/Kg	4.6	U	2.1	U	2.6	U	4.1	U
Gamma bhc (lindane)	ug/Kg	4.6	U	2.1	U	2.6	U	4.1	U
Alpha-chlordane	ug/Kg	4.6	U	2.1	U	2.6	U	4.1	U
Gamma-chlordane	ug/Kg	4.6	U	2.1	U	2.6	U	4.1	U
p,p'-DDD	ug/Kg	2.4	J	4.1	U	3.5	J	1.1	J
p,p'-DDE	ug/Kg	8.9	U	3.6	J	3.6	J	2.8	J
p,p'-DDT	ug/Kg	8.9	U	2	J	5.2	U	8	UJ
Dieldrin	ug/Kg	8.9	U	4.1	U	5.2	U	8	U
Alpha endosulfan	ug/Kg	4.6	U	2.1	U	2.6	U	4.1	U
Beta endosulfan	ug/Kg	8.9	U	4.1	U	5.2	U	8	U
Endosulfan sulfate	ug/Kg	8.9	U	4.1	U	5.2	U	8	U
Endrin	ug/Kg	8.9	U	4.1	U	5.2	U	8	U
Endrin aldehyde	ug/Kg	8.9	U	4.1	U	5.2	U	8	U
Endrin ketone	ug/Kg	8.9	U	4.1	U	5.2	U	8	UJ
Heptachlor epoxide	ug/Kg	4.6	U	2.1	U	2.6	U	4.1	U
Heptachlor	ug/Kg	4.6	U	2.1	U	2.6	U	4.1	U
Methoxychlor	ug/Kg	46	U	21	U	26	U	41	U
Toxaphene	ug/Kg	460	U	210	U	260	U	410	UJ

Analytical Data Summary

	StationID	NDW06SD16	
	SampleID	NDW06SD16K-R01	
	Date Collected	09/05/03	
	SampleType	N	
Parameter	Units		
Aldrin	ug/Kg	4.2	UJ
Alpha bhc (alpha hexachlorocyclohexane)	ug/Kg	4.2	UJ
Beta bhc (beta hexachlorocyclohexane)	ug/Kg	4.2	UJ
Delta bhc (delta hexachlorocyclohexane)	ug/Kg	4.2	UJ
Gamma bhc (lindane)	ug/Kg	4.2	UJ
Alpha-chlordane	ug/Kg	4.2	UJ
Gamma-chlordane	ug/Kg	4.2	UJ
p,p'-DDD	ug/Kg	8.2	UJ
p,p'-DDE	ug/Kg	8.2	UJ
p,p'-DDT	ug/Kg	8.2	UJ
Dieldrin	ug/Kg	8.2	UJ
Alpha endosulfan	ug/Kg	4.2	UJ
Beta endosulfan	ug/Kg	8.2	UJ
Endosulfan sulfate	ug/Kg	8.2	UJ
Endrin	ug/Kg	8.2	UJ
Endrin aldehyde	ug/Kg	8.2	UJ
Endrin ketone	ug/Kg	8.2	UJ
Heptachlor epoxide	ug/Kg	4.2	UJ
Heptachlor	ug/Kg	4.2	UJ
Methoxychlor	ug/Kg	42	UJ
Toxaphene	ug/Kg	420	UJ

Analytical Data Summary

	StationID	W6-SD01		W6-SD02		W6-SD03		W6-SD03	
	SampleID	NDA042		NDA043		NDA044		NDA307FD1	
	Date Collected	04/13/00		04/13/00		04/13/00		04/13/00	
	SampleType	N		N		N		FD	
Parameter	Units								
1,2,4-TRICHLOROBENZENE	ug/Kg	686	UJ	735	UJ	1680	UJ	2130	UJ
1,2-DICHLOROBENZENE	ug/Kg	686	UJ	735	UJ	1680	UJ	2130	UJ
1,3-DICHLOROBENZENE	ug/Kg	686	UJ	735	UJ	1680	UJ	2130	UJ
1,4-DICHLOROBENZENE	ug/Kg	686	UJ	735	UJ	1680	UJ	2130	UJ
2,4,5-TRICHLOROPHENOL	ug/Kg	2060	UJ	2200	UJ	5050	UJ	6380	UJ
2,4,6-TRICHLOROPHENOL	ug/Kg	686	UJ	735	UJ	1680	UJ	2130	UJ
2,4-DICHLOROPHENOL	ug/Kg	686	UJ	735	UJ	1680	UJ	2130	UJ
2,4-DIMETHYLPHENOL	ug/Kg	686	UJ	735	UJ	1680	UJ	2130	UJ
2,4-DINITROPHENOL	ug/Kg	2060	UJ	2200	UJ	5050	UJ	6380	UJ
2,4-DINITROTOLUENE	ug/Kg	686	UJ	735	UJ	1680	UJ	2130	UJ
2,6-DINITROTOLUENE	ug/Kg	686	UJ	735	UJ	1680	UJ	2130	UJ
2-CHLORONAPHTHALENE	ug/Kg	686	UJ	735	UJ	1680	UJ	2130	UJ
2-CHLOROPHENOL	ug/Kg	686	UJ	735	UJ	1680	UJ	2130	UJ
2-METHYLNAPHTHALENE	ug/Kg	686	UJ	735	UJ	1680	UJ	2130	UJ
2-METHYLPHENOL (o-CRESOL)	ug/Kg	686	UJ	735	UJ	1680	UJ	2130	UJ
2-NITROANILINE	ug/Kg	2060	UJ	2200	UJ	5050	UJ	6380	UJ
2-NITROPHENOL	ug/Kg	686	UJ	735	UJ	1680	UJ	2130	UJ
3,3'-DICHLOROBENZIDINE	ug/Kg	1370	UJ	1470	UJ	3370	UJ	4250	UJ
3-NITROANILINE	ug/Kg	2060	UJ	2200	UJ	5050	UJ	6380	UJ
4,6-DINITRO-2-METHYLPHENOL	ug/Kg	2060	UJ	2200	UJ	5050	UJ	6380	UJ
4-BROMOPHENYL PHENYL ETHER	ug/Kg	686	UJ	735	UJ	1680	UJ	2130	UJ
4-CHLORO-3-METHYLPHENOL	ug/Kg	686	UJ	735	UJ	1680	UJ	2130	UJ
4-CHLOROANILINE	ug/Kg	686	UJ	735	UJ	1680	UJ	2130	UJ
4-CHLOROPHENYL PHENYL ETHER	ug/Kg	686	UJ	735	UJ	1680	UJ	2130	UJ
4-METHYLPHENOL (p-CRESOL)	ug/Kg								
4-NITROANILINE	ug/Kg	2060	UJ	2200	UJ	5050	UJ	6380	UJ
4-NITROPHENOL	ug/Kg	2060	UJ	2200	UJ	5050	UJ	6380	UJ
ACENAPHTHENE	ug/Kg	686	UJ	735	UJ	1680	UJ	2130	UJ
ACENAPHTHYLENE	ug/Kg	686	UJ	735	UJ	1680	UJ	2130	UJ
ACETOPHENONE	ug/Kg								
ANTHRACENE	ug/Kg	686	UJ	735	UJ	1680	UJ	2130	UJ
ATRAZINE	ug/Kg								
BENZALDEHYDE	ug/Kg								
BENZO(a)ANTHRACENE	ug/Kg	686	UJ	735	UJ	1680	UJ	2130	UJ
BENZO(a)PYRENE	ug/Kg	686	UJ	735	UJ	1680	UJ	2130	UJ
BENZO(b)FLUORANTHENE	ug/Kg	686	UJ	735	UJ	1680	UJ	2130	UJ
BENZO(g,h,i)PERYLENE	ug/Kg	686	UJ	735	UJ	1680	UJ	2130	UJ

Analytical Data Summary

	StationID	W6-SD04		W6-SD05		W6-SD06		W6-SD07	
	SampleID	NDA045		NDA046		NDA302		NDA303	
	Date Collected	04/13/00		04/13/00		04/13/00		04/13/00	
	SampleType	N		N		N		N	
Parameter	Units								
1,2,4-TRICHLOROBENZENE	ug/Kg	1500	UJ	1520	UJ	1200	UJ	2300	UJ
1,2-DICHLOROBENZENE	ug/Kg	1500	UJ	1520	UJ	1200	UJ	2300	UJ
1,3-DICHLOROBENZENE	ug/Kg	1500	UJ	1520	UJ	1200	UJ	2300	UJ
1,4-DICHLOROBENZENE	ug/Kg	1500	UJ	1520	UJ	1200	UJ	2300	UJ
2,4,5-TRICHLOROPHENOL	ug/Kg	4500	UJ	4560	UJ	3600	UJ	6900	UJ
2,4,6-TRICHLOROPHENOL	ug/Kg	1500	UJ	1520	UJ	1200	UJ	2300	UJ
2,4-DICHLOROPHENOL	ug/Kg	1500	UJ	1520	UJ	1200	UJ	2300	UJ
2,4-DIMETHYLPHENOL	ug/Kg	1500	UJ	1520	UJ	1200	UJ	2300	UJ
2,4-DINITROPHENOL	ug/Kg	4500	UJ	4560	UJ	3600	UJ	6900	UJ
2,4-DINITROTOLUENE	ug/Kg	1500	UJ	1520	UJ	1200	UJ	2300	UJ
2,6-DINITROTOLUENE	ug/Kg	1500	UJ	1520	UJ	1200	UJ	2300	UJ
2-CHLORONAPHTHALENE	ug/Kg	1500	UJ	1520	UJ	1200	UJ	2300	UJ
2-CHLOROPHENOL	ug/Kg	1500	UJ	1520	UJ	1200	UJ	2300	UJ
2-METHYLNAPHTHALENE	ug/Kg	1500	UJ	1520	UJ	1200	UJ	2300	UJ
2-METHYLPHENOL (o-CRESOL)	ug/Kg	1500	UJ	1520	UJ	1200	UJ	2300	UJ
2-NITROANILINE	ug/Kg	4500	UJ	4560	UJ	3600	UJ	6900	UJ
2-NITROPHENOL	ug/Kg	1500	UJ	1520	UJ	1200	UJ	2300	UJ
3,3'-DICHLOROBENZIDINE	ug/Kg	3000	UJ	3040	UJ	2400	UJ	4600	UJ
3-NITROANILINE	ug/Kg	4500	UJ	4560	UJ	3600	UJ	6900	UJ
4,6-DINITRO-2-METHYLPHENOL	ug/Kg	4500	UJ	4560	UJ	3600	UJ	6900	UJ
4-BROMOPHENYL PHENYL ETHER	ug/Kg	1500	UJ	1520	UJ	1200	UJ	2300	UJ
4-CHLORO-3-METHYLPHENOL	ug/Kg	1500	UJ	1520	UJ	1200	UJ	2300	UJ
4-CHLOROANILINE	ug/Kg	1500	UJ	1520	UJ	1200	UJ	2300	UJ
4-CHLOROPHENYL PHENYL ETHER	ug/Kg	1500	UJ	1520	UJ	1200	UJ	2300	UJ
4-METHYLPHENOL (p-CRESOL)	ug/Kg								
4-NITROANILINE	ug/Kg	4500	UJ	4560	UJ	3600	UJ	6900	UJ
4-NITROPHENOL	ug/Kg	4500	UJ	4560	UJ	3600	UJ	6900	UJ
ACENAPHTHENE	ug/Kg	1500	UJ	1520	UJ	1200	UJ	2300	UJ
ACENAPHTHYLENE	ug/Kg	1500	UJ	1520	UJ	1200	UJ	2300	UJ
ACETOPHENONE	ug/Kg								
ANTHRACENE	ug/Kg	1500	UJ	1520	UJ	1200	UJ	2300	UJ
ATRAZINE	ug/Kg								
BENZALDEHYDE	ug/Kg								
BENZO(a)ANTHRACENE	ug/Kg	1500	UJ	1520	UJ	1200	UJ	2300	UJ
BENZO(a)PYRENE	ug/Kg	1500	UJ	1520	UJ	1200	UJ	2300	UJ
BENZO(b)FLUORANTHENE	ug/Kg	1500	UJ	1520	UJ	1200	UJ	2300	UJ
BENZO(g,h,i)PERYLENE	ug/Kg	1500	UJ	1520	UJ	1200	UJ	2300	UJ

Analytical Data Summary

	StationID	NDW06SD02		NDW06SD02		NDW06SD03		NDW06SD05	
	SampleID	NDW06FD03P-R01		NDW06SD02-R01		NDW06SD03-R01		NDW06SD05-R01	
	Date Collected	09/03/03		09/03/03		09/03/03		09/03/03	
	SampleType	FD		N		N		N	
Parameter	Units								
1,2,4-TRICHLOROBENZENE	ug/Kg								
1,2-DICHLOROBENZENE	ug/Kg								
1,3-DICHLOROBENZENE	ug/Kg								
1,4-DICHLOROBENZENE	ug/Kg								
2,4,5-TRICHLOROPHENOL	ug/Kg	1340	U	1470	U	2290	U	3110	U
2,4,6-TRICHLOROPHENOL	ug/Kg	448	U	490	U	763	U	1040	U
2,4-DICHLOROPHENOL	ug/Kg	448	U	490	U	763	U	1040	U
2,4-DIMETHYLPHENOL	ug/Kg	448	U	490	U	763	U	1040	U
2,4-DINITROPHENOL	ug/Kg	1340	UJ	1470	UJ	2290	UJ	3110	UJ
2,4-DINITROTOLUENE	ug/Kg	448	U	490	U	763	U	1040	U
2,6-DINITROTOLUENE	ug/Kg	448	U	490	U	763	U	1040	U
2-CHLORONAPHTHALENE	ug/Kg	448	U	490	U	763	U	1040	U
2-CHLOROPHENOL	ug/Kg	448	U	490	U	763	U	1040	U
2-METHYLNAPHTHALENE	ug/Kg	448	U	490	U	763	U	1040	U
2-METHYLPHENOL (o-CRESOL)	ug/Kg	448	U	490	U	763	U	1040	U
2-NITROANILINE	ug/Kg	1340	U	1470	U	2290	U	3110	U
2-NITROPHENOL	ug/Kg	448	U	490	U	763	U	1040	U
3,3'-DICHLOROBENZIDINE	ug/Kg	908	U	995	U	1550	U	2100	U
3-NITROANILINE	ug/Kg	1340	U	1470	U	2290	U	3110	U
4,6-DINITRO-2-METHYLPHENOL	ug/Kg	1340	U	1470	U	2290	U	3110	U
4-BROMOPHENYL PHENYL ETHER	ug/Kg	448	U	490	U	763	U	1040	U
4-CHLORO-3-METHYLPHENOL	ug/Kg	448	U	490	U	763	U	1040	U
4-CHLOROANILINE	ug/Kg	448	R	490	R	763	R	1040	R
4-CHLOROPHENYL PHENYL ETHER	ug/Kg	448	U	490	U	763	U	1040	U
4-METHYLPHENOL (p-CRESOL)	ug/Kg	448	U	490	U	763	U	1040	U
4-NITROANILINE	ug/Kg	1340	U	1470	U	2290	U	3110	U
4-NITROPHENOL	ug/Kg	1340	U	1470	U	2290	U	3110	U
ACENAPHTHENE	ug/Kg	448	U	490	U	763	U	1040	U
ACENAPHTHYLENE	ug/Kg	448	U	490	U	763	U	1040	U
ACETOPHENONE	ug/Kg	448	U	490	U	763	U	1040	U
ANTHRACENE	ug/Kg	448	U	490	U	763	U	1040	U
ATRAZINE	ug/Kg	448	U	490	U	763	U	1040	U
BENZALDEHYDE	ug/Kg	448	R	490	R	763	R	1040	R
BENZO(a)ANTHRACENE	ug/Kg	448	U	490	U	763	U	1040	U
BENZO(a)PYRENE	ug/Kg	448	U	490	U	763	U	1040	U
BENZO(b)FLUORANTHENE	ug/Kg	448	U	490	U	763	U	1040	U
BENZO(g,h,i)PERYLENE	ug/Kg	448	U	490	U	763	U	1040	U

Analytical Data Summary

	StationID	NDW06SD11		NDW06SD13		NDW06SD14		NDW06SD06	
	SampleID	NDW06SD11-R01		NDW06SD13-R01		NDW06SD14-R01		NDW06SD06-R01	
	Date Collected	09/03/03		09/03/03		09/03/03		09/04/03	
	SampleType	N		N		N		N	
Parameter	Units								
1,2,4-TRICHLOROBENZENE	ug/Kg								
1,2-DICHLOROBENZENE	ug/Kg								
1,3-DICHLOROBENZENE	ug/Kg								
1,4-DICHLOROBENZENE	ug/Kg								
2,4,5-TRICHLOROPHENOL	ug/Kg	1330	U	1300	U	1500	U	2380	UJ
2,4,6-TRICHLOROPHENOL	ug/Kg	444	U	433	U	500	U	793	R
2,4-DICHLOROPHENOL	ug/Kg	444	U	433	U	500	U	793	U
2,4-DIMETHYLPHENOL	ug/Kg	444	U	433	U	500	U	793	U
2,4-DINITROPHENOL	ug/Kg	1330	UJ	1300	UJ	1500	UJ	2380	UJ
2,4-DINITROTOLUENE	ug/Kg	444	U	433	U	500	U	793	U
2,6-DINITROTOLUENE	ug/Kg	444	U	433	U	500	U	793	U
2-CHLORONAPHTHALENE	ug/Kg	444	U	433	U	500	U	793	U
2-CHLOROPHENOL	ug/Kg	444	U	433	U	500	U	793	U
2-METHYLNAPHTHALENE	ug/Kg	444	U	433	U	500	U	793	U
2-METHYLPHENOL (o-CRESOL)	ug/Kg	444	U	433	U	500	U	793	U
2-NITROANILINE	ug/Kg	1330	U	1300	U	1500	U	2380	U
2-NITROPHENOL	ug/Kg	444	U	433	U	500	U	793	U
3,3'-DICHLOROBENZIDINE	ug/Kg	902	U	880	U	1020	U	1610	U
3-NITROANILINE	ug/Kg	1330	U	1300	U	1500	U	2380	U
4,6-DINITRO-2-METHYLPHENOL	ug/Kg	1330	U	1300	U	1500	U	2380	UJ
4-BROMOPHENYL PHENYL ETHER	ug/Kg	444	U	433	U	500	U	793	U
4-CHLORO-3-METHYLPHENOL	ug/Kg	444	U	433	U	500	U	793	U
4-CHLOROANILINE	ug/Kg	444	R	433	R	500	R	793	U
4-CHLOROPHENYL PHENYL ETHER	ug/Kg	444	U	433	U	500	U	793	U
4-METHYLPHENOL (p-CRESOL)	ug/Kg	444	U	433	U	500	U	793	U
4-NITROANILINE	ug/Kg	1330	U	1300	U	1500	U	2380	U
4-NITROPHENOL	ug/Kg	1330	U	1300	U	1500	U	2380	U
ACENAPHTHENE	ug/Kg	444	U	433	U	500	U	793	U
ACENAPHTHYLENE	ug/Kg	444	U	433	U	500	U	793	U
ACETOPHENONE	ug/Kg	444	U	433	U	500	U	793	U
ANTHRACENE	ug/Kg	444	U	433	U	500	U	793	U
ATRAZINE	ug/Kg	444	U	433	U	500	U	793	U
BENZALDEHYDE	ug/Kg	444	R	433	R	500	R	793	R
BENZO(a)ANTHRACENE	ug/Kg	444	U	433	U	500	U	793	U
BENZO(a)PYRENE	ug/Kg	444	U	433	U	500	U	793	U
BENZO(b)FLUORANTHENE	ug/Kg	444	U	433	U	500	U	793	U
BENZO(g,h,i)PERYLENE	ug/Kg	444	U	433	U	500	U	793	U

Analytical Data Summary

	StationID	NDW06SD07		NDW06SD08		NDW06SD09		NDW06SD10	
	SampleID	NDW06SD07-R01		NDW06SD08-R01		NDW06SD09-R01		NDW06SD10-R01	
	Date Collected	09/04/03		09/04/03		09/04/03		09/04/03	
	SampleType	N		N		N		N	
Parameter	Units								
1,2,4-TRICHLOROBENZENE	ug/Kg								
1,2-DICHLOROBENZENE	ug/Kg								
1,3-DICHLOROBENZENE	ug/Kg								
1,4-DICHLOROBENZENE	ug/Kg								
2,4,5-TRICHLOROPHENOL	ug/Kg	3140	UJ	3180	UJ	2640	UJ	1220	UJ
2,4,6-TRICHLOROPHENOL	ug/Kg	1050	R	1060	R	880	R	408	R
2,4-DICHLOROPHENOL	ug/Kg	1050	U	1060	U	880	U	408	U
2,4-DIMETHYLPHENOL	ug/Kg	1050	U	1060	U	880	U	408	U
2,4-DINITROPHENOL	ug/Kg	3140	UJ	3180	UJ	2640	UJ	1220	UJ
2,4-DINITROTOLUENE	ug/Kg	1050	U	1060	U	880	U	408	U
2,6-DINITROTOLUENE	ug/Kg	1050	U	1060	U	880	U	408	U
2-CHLORONAPHTHALENE	ug/Kg	1050	U	1060	U	880	U	408	U
2-CHLOROPHENOL	ug/Kg	1050	U	1060	U	880	U	408	U
2-METHYLNAPHTHALENE	ug/Kg	1050	U	1060	U	880	U	408	U
2-METHYLPHENOL (o-CRESOL)	ug/Kg	1050	U	1060	U	880	U	408	U
2-NITROANILINE	ug/Kg	3140	U	3180	U	2640	U	1220	U
2-NITROPHENOL	ug/Kg	1050	U	1060	U	880	U	408	U
3,3'-DICHLOROBENZIDINE	ug/Kg	2120	U	2150	U	1780	U	827	U
3-NITROANILINE	ug/Kg	3140	U	3180	U	2640	U	1220	U
4,6-DINITRO-2-METHYLPHENOL	ug/Kg	3140	UJ	3180	UJ	2640	UJ	1220	UJ
4-BROMOPHENYL PHENYL ETHER	ug/Kg	1050	U	1060	U	880	U	408	U
4-CHLORO-3-METHYLPHENOL	ug/Kg	1050	U	1060	U	880	U	408	U
4-CHLOROANILINE	ug/Kg	1050	U	1060	U	880	U	408	U
4-CHLOROPHENYL PHENYL ETHER	ug/Kg	1050	U	1060	U	880	U	408	U
4-METHYLPHENOL (p-CRESOL)	ug/Kg	1050	U	1060	U	880	U	408	U
4-NITROANILINE	ug/Kg	3140	U	3180	U	2640	U	1220	U
4-NITROPHENOL	ug/Kg	3140	U	3180	U	2640	U	1220	U
ACENAPHTHENE	ug/Kg	1050	U	1060	U	880	U	408	U
ACENAPHTHYLENE	ug/Kg	1050	U	1060	U	880	U	408	U
ACETOPHENONE	ug/Kg	1050	U	1060	U	880	U	408	U
ANTHRACENE	ug/Kg	1050	U	1060	U	880	U	408	U
ATRAZINE	ug/Kg	1050	U	1060	U	880	U	408	U
BENZALDEHYDE	ug/Kg	1050	R	1060	R	880	R	408	R
BENZO(a)ANTHRACENE	ug/Kg	1050	U	1060	U	880	U	408	U
BENZO(a)PYRENE	ug/Kg	1050	U	1060	U	880	U	408	U
BENZO(b)FLUORANTHENE	ug/Kg	1050	U	1060	U	880	U	408	U
BENZO(g,h,i)PERYLENE	ug/Kg	1050	U	1060	U	880	U	40.9	J

Analytical Data Summary

	StationID	NDW06SD12		NDW06SD15		NDW06SD16	
	SampleID	NDW06SD12-R01		NDW06SD15K-R01		NDW06SD16K-R01	
	Date Collected	09/04/03		09/05/03		09/05/03	
	SampleType	N		N		N	
Parameter	Units						
1,2,4-TRICHLOROBENZENE	ug/Kg						
1,2-DICHLOROBENZENE	ug/Kg						
1,3-DICHLOROBENZENE	ug/Kg						
1,4-DICHLOROBENZENE	ug/Kg						
2,4,5-TRICHLOROPHENOL	ug/Kg	1540	UJ	2400	UJ	2450	UJ
2,4,6-TRICHLOROPHENOL	ug/Kg	512	R	800	R	816	R
2,4-DICHLOROPHENOL	ug/Kg	512	U	800	U	816	U
2,4-DIMETHYLPHENOL	ug/Kg	512	U	800	U	816	U
2,4-DINITROPHENOL	ug/Kg	1540	UJ	2400	UJ	2450	UJ
2,4-DINITROTOLUENE	ug/Kg	512	U	800	U	816	U
2,6-DINITROTOLUENE	ug/Kg	512	U	800	U	816	U
2-CHLORONAPHTHALENE	ug/Kg	512	U	800	U	816	U
2-CHLOROPHENOL	ug/Kg	512	U	800	U	816	U
2-METHYLNAPHTHALENE	ug/Kg	512	U	800	U	816	U
2-METHYLPHENOL (o-CRESOL)	ug/Kg	512	U	800	U	816	U
2-NITROANILINE	ug/Kg	1540	U	2400	U	2450	U
2-NITROPHENOL	ug/Kg	512	U	800	U	816	U
3,3'-DICHLOROBENZIDINE	ug/Kg	1040	U	1620	U	1660	U
3-NITROANILINE	ug/Kg	1540	U	2400	U	2450	U
4,6-DINITRO-2-METHYLPHENOL	ug/Kg	1540	UJ	2400	UJ	2450	UJ
4-BROMOPHENYL PHENYL ETHER	ug/Kg	512	U	800	U	816	U
4-CHLORO-3-METHYLPHENOL	ug/Kg	512	U	800	U	816	U
4-CHLOROANILINE	ug/Kg	512	U	800	U	816	U
4-CHLOROPHENYL PHENYL ETHER	ug/Kg	512	U	800	U	816	U
4-METHYLPHENOL (p-CRESOL)	ug/Kg	512	U	800	U	816	U
4-NITROANILINE	ug/Kg	1540	U	2400	U	2450	U
4-NITROPHENOL	ug/Kg	1540	U	2400	U	2450	U
ACENAPHTHENE	ug/Kg	512	U	800	U	816	U
ACENAPHTHYLENE	ug/Kg	512	U	800	U	816	U
ACETOPHENONE	ug/Kg	512	U	800	R	816	R
ANTHRACENE	ug/Kg	38	J	800	U	816	U
ATRAZINE	ug/Kg	512	U	800	U	816	U
BENZALDEHYDE	ug/Kg	512	R	800	R	816	R
BENZO(a)ANTHRACENE	ug/Kg	64.6	J	800	U	816	U
BENZO(a)PYRENE	ug/Kg	79.7	J	800	U	816	U
BENZO(b)FLUORANTHENE	ug/Kg	91.6	J	800	U	816	U
BENZO(g,h,i)PERYLENE	ug/Kg	512	U	800	U	816	U

Analytical Data Summary

Parameter	Units	StationID		W6-SD01		W6-SD02		W6-SD03		W6-SD03	
		SampleID		NDA042		NDA043		NDA044		NDA307FD1	
		Date Collected		04/13/00		04/13/00		04/13/00		04/13/00	
		SampleType		N		N		N		FD	
BENZO(k)FLUORANTHENE	ug/Kg		686	UJ	735	UJ	1680	UJ	2130	UJ	
BENZYL BUTYL PHTHALATE	ug/Kg		686	UJ	735	UJ	1680	UJ	2130	UJ	
BIPHENYL (DIPHENYL)	ug/Kg										
bis(2-CHLOROETHOXY) METHANE	ug/Kg		686	UJ	735	UJ	1680	UJ	2130	UJ	
bis(2-CHLOROETHYL) ETHER (2-CHLOROETHYL ETHER)	ug/Kg		686	UJ	735	UJ	1680	UJ	2130	UJ	
bis(2-CHLOROISOPROPYL) ETHER	ug/Kg		686	UJ	735	UJ	1680	UJ	2130	UJ	
bis(2-ETHYLHEXYL) PHTHALATE	ug/Kg		686	UJ	735	UJ	1680	UJ	2130	UJ	
CAPROLACTAM	ug/Kg										
CARBAZOLE	ug/Kg		686	UJ	735	UJ	1680	UJ	2130	UJ	
CHRYSENE	ug/Kg		686	UJ	735	UJ	1680	UJ	2130	UJ	
CRESOLS, m & p	ug/Kg		686	UJ	735	UJ	1680	UJ	2130	UJ	
DI-n-BUTYL PHTHALATE	ug/Kg		686	UJ	735	UJ	1680	UJ	2130	UJ	
DI-n-OCTYLPHTHALATE	ug/Kg		686	UJ	735	UJ	1680	UJ	2130	UJ	
DIBENZ(a,h)ANTHRACENE	ug/Kg		686	UJ	735	UJ	1680	UJ	2130	UJ	
DIBENZOFURAN	ug/Kg		686	UJ	735	UJ	1680	UJ	2130	UJ	
DIETHYL PHTHALATE	ug/Kg		686	UJ	735	UJ	1680	UJ	2130	UJ	
DIMETHYL PHTHALATE	ug/Kg		686	UJ	735	UJ	1680	UJ	2130	UJ	
FLUORANTHENE	ug/Kg		686	UJ	735	UJ	1680	UJ	2130	UJ	
FLUORENE	ug/Kg		686	UJ	735	UJ	1680	UJ	2130	UJ	
HEXACHLOROBENZENE	ug/Kg		686	UJ	735	UJ	1680	UJ	2130	UJ	
HEXACHLOROBUTADIENE	ug/Kg		686	UJ	735	UJ	1680	UJ	2130	UJ	
HEXACHLOROCYCLOPENTADIENE	ug/Kg		686	UJ	735	UJ	1680	UJ	2130	UJ	
HEXACHLOROETHANE	ug/Kg		686	UJ	735	UJ	1680	UJ	2130	UJ	
INDENO(1,2,3-c,d)PYRENE	ug/Kg		686	UJ	735	UJ	1680	UJ	2130	UJ	
ISOPHORONE	ug/Kg		686	UJ	735	UJ	1680	UJ	2130	UJ	
N-NITROSODI-n-PROPYLAMINE	ug/Kg		686	UJ	735	UJ	1680	UJ	2130	UJ	
N-NITROSODIPHENYLAMINE	ug/Kg		686	UJ	735	UJ	1680	UJ	2130	UJ	
NAPHTHALENE	ug/Kg		686	UJ	735	UJ	1680	UJ	2130	UJ	
NITROBENZENE	ug/Kg		686	UJ	735	UJ	1680	UJ	2130	UJ	
PENTACHLOROPHENOL	ug/Kg		2060	UJ	2200	UJ	5050	UJ	6380	UJ	
PHENANTHRENE	ug/Kg		686	UJ	735	UJ	1680	UJ	2130	UJ	
PHENOL	ug/Kg		686	UJ	735	UJ	1680	UJ	2130	UJ	
PYRENE	ug/Kg		686	UJ	735	UJ	1680	UJ	2130	UJ	

Analytical Data Summary

Parameter	Units	StationID		W6-SD05		W6-SD06		W6-SD07	
		SampleID		NDA046		NDA302		NDA303	
		Date Collected		04/13/00		04/13/00		04/13/00	
		SampleType		N		N		N	
BENZO(k)FLUORANTHENE	ug/Kg	1500	UJ	1520	UJ	1200	UJ	2300	UJ
BENZYL BUTYL PHTHALATE	ug/Kg	1500	UJ	1520	UJ	1200	UJ	2300	UJ
BIPHENYL (DIPHENYL)	ug/Kg								
bis(2-CHLOROETHOXY) METHANE	ug/Kg	1500	UJ	1520	UJ	1200	UJ	2300	UJ
bis(2-CHLOROETHYL) ETHER (2-CHLOROETHYL ETHER)	ug/Kg	1500	UJ	1520	UJ	1200	UJ	2300	UJ
bis(2-CHLOROISOPROPYL) ETHER	ug/Kg	1500	UJ	1520	UJ	1200	UJ	2300	UJ
bis(2-ETHYLHEXYL) PHTHALATE	ug/Kg	1500	UJ	1520	UJ	1200	UJ	2300	UJ
CAPROLACTAM	ug/Kg								
CARBAZOLE	ug/Kg	1500	UJ	1520	UJ	1200	UJ	2300	UJ
CHRYSENE	ug/Kg	1500	UJ	1520	UJ	1200	UJ	2300	UJ
CRESOLS, m & p	ug/Kg	1500	UJ	1520	UJ	1200	UJ	2300	UJ
DI-n-BUTYL PHTHALATE	ug/Kg	1500	UJ	1520	UJ	1200	UJ	2300	UJ
DI-n-OCTYLPHTHALATE	ug/Kg	1500	UJ	1520	UJ	1200	UJ	2300	UJ
DIBENZ(a,h)ANTHRACENE	ug/Kg	1500	UJ	1520	UJ	1200	UJ	2300	UJ
DIBENZOFURAN	ug/Kg	1500	UJ	1520	UJ	1200	UJ	2300	UJ
DIETHYL PHTHALATE	ug/Kg	1500	UJ	1520	UJ	1200	UJ	2300	UJ
DIMETHYL PHTHALATE	ug/Kg	1500	UJ	1520	UJ	1200	UJ	2300	UJ
FLUORANTHENE	ug/Kg	1500	UJ	1520	UJ	1200	UJ	2300	UJ
FLUORENE	ug/Kg	1500	UJ	1520	UJ	1200	UJ	2300	UJ
HEXACHLOROBENZENE	ug/Kg	1500	UJ	1520	UJ	1200	UJ	2300	UJ
HEXACHLOROBUTADIENE	ug/Kg	1500	UJ	1520	UJ	1200	UJ	2300	UJ
HEXACHLOROCYCLOPENTADIENE	ug/Kg	1500	UJ	1520	UJ	1200	UJ	2300	UJ
HEXACHLOROETHANE	ug/Kg	1500	UJ	1520	UJ	1200	UJ	2300	UJ
INDENO(1,2,3-c,d)PYRENE	ug/Kg	1500	UJ	1520	UJ	1200	UJ	2300	UJ
ISOPHORONE	ug/Kg	1500	UJ	1520	UJ	1200	UJ	2300	UJ
N-NITROSODI-n-PROPYLAMINE	ug/Kg	1500	UJ	1520	UJ	1200	UJ	2300	UJ
N-NITROSODIPHENYLAMINE	ug/Kg	1500	UJ	1520	UJ	1200	UJ	2300	UJ
NAPHTHALENE	ug/Kg	1500	UJ	1520	UJ	1200	UJ	2300	UJ
NITROBENZENE	ug/Kg	1500	UJ	1520	UJ	1200	UJ	2300	UJ
PENTACHLOROPHENOL	ug/Kg	4500	UJ	4560	UJ	3600	UJ	6900	UJ
PHENANTHRENE	ug/Kg	1500	UJ	1520	UJ	1200	UJ	2300	UJ
PHENOL	ug/Kg	1500	UJ	1520	UJ	1200	UJ	2300	UJ
PYRENE	ug/Kg	1500	UJ	1520	UJ	1200	UJ	2300	UJ

Analytical Data Summary

Parameter	Units	StationID		NDW06SD02		NDW06SD03		NDW06SD05	
		SampleID		NDW06FD03P-R01		NDW06SD02-R01		NDW06SD03-R01		NDW06SD05-R01	
		Date Collected		09/03/03		09/03/03		09/03/03		09/03/03	
		SampleType		FD		N		N		N	
BENZO(k)FLUORANTHENE	ug/Kg		448	U	490	U	763	U	1040	U
BENZYL BUTYL PHTHALATE	ug/Kg		448	U	490	U	763	U	1040	U
BIPHENYL (DIPHENYL)	ug/Kg		448	U	490	U	763	U	1040	U
bis(2-CHLOROETHOXY) METHANE	ug/Kg		448	U	490	U	763	U	1040	U
bis(2-CHLOROETHYL) ETHER (2-CHLOROETHYL ETHER)	ug/Kg		448	U	490	U	763	U	1040	U
bis(2-CHLOROISOPROPYL) ETHER	ug/Kg		448	U	490	U	763	U	1040	U
bis(2-ETHYLHEXYL) PHTHALATE	ug/Kg		147	J	160	J	284	J	446	J
CAPROLACTAM	ug/Kg		448	U	490	U	763	U	1040	U
CARBAZOLE	ug/Kg		448	U	490	U	763	U	1040	U
CHRYSENE	ug/Kg		448	U	490	U	763	U	1040	U
CRESOLS, m & p	ug/Kg									
DI-n-BUTYL PHTHALATE	ug/Kg		448	U	490	U	763	U	1040	U
DI-n-OCTYLPHTHALATE	ug/Kg		448	U	490	U	763	U	1040	U
DIBENZ(a,h)ANTHRACENE	ug/Kg		448	U	490	U	763	U	1040	U
DIBENZOFURAN	ug/Kg		448	U	490	U	763	U	1040	U
DIETHYL PHTHALATE	ug/Kg		448	U	490	U	763	U	1040	U
DIMETHYL PHTHALATE	ug/Kg		448	U	490	U	763	U	1040	U
FLUORANTHENE	ug/Kg		448	U	490	U	763	U	1040	U
FLUORENE	ug/Kg		448	U	490	U	763	U	1040	U
HEXACHLOROBENZENE	ug/Kg		448	U	490	U	763	U	1040	U
HEXACHLOROBUTADIENE	ug/Kg		448	U	490	U	763	U	1040	U
HEXACHLOROCYCLOPENTADIENE	ug/Kg		448	U	490	U	763	U	1040	U
HEXACHLOROETHANE	ug/Kg		448	U	490	U	763	U	1040	U
INDENO(1,2,3-c,d)PYRENE	ug/Kg		448	U	490	U	763	U	1040	U
ISOPHORONE	ug/Kg		448	U	490	U	763	U	1040	U
N-NITROSODI-n-PROPYLAMINE	ug/Kg		448	U	490	U	763	U	1040	U
N-NITROSODIPHENYLAMINE	ug/Kg		448	U	490	U	763	U	1040	U
NAPHTHALENE	ug/Kg		448	U	490	U	763	U	1040	U
NITROBENZENE	ug/Kg		448	U	490	U	763	U	1040	U
PENTACHLOROPHENOL	ug/Kg		1340	U	1470	U	2290	U	3110	U
PHENANTHRENE	ug/Kg		448	U	490	U	763	U	1040	U
PHENOL	ug/Kg		448	U	490	U	763	U	1040	U
PYRENE	ug/Kg		448	U	490	U	763	U	1040	U

Analytical Data Summary

Parameter	Units	StationID		NDW06SD13		NDW06SD14		NDW06SD06	
		SampleID		NDW06SD13-R01		NDW06SD14-R01		NDW06SD06-R01	
		Date Collected		09/03/03		09/03/03		09/04/03	
		SampleType		N		N		N	
BENZO(k)FLUORANTHENE	ug/Kg	444	U	433	U	500	U	793	U
BENZYL BUTYL PHTHALATE	ug/Kg	444	U	433	U	500	U	793	U
BIPHENYL (DIPHENYL)	ug/Kg	444	U	433	U	500	U	793	U
bis(2-CHLOROETHOXY) METHANE	ug/Kg	444	U	433	U	500	U	793	R
bis(2-CHLOROETHYL) ETHER (2-CHLOROETHYL ETHER)	ug/Kg	444	U	433	U	500	U	793	U
bis(2-CHLOROISOPROPYL) ETHER	ug/Kg	444	U	433	U	500	U	793	U
bis(2-ETHYLHEXYL) PHTHALATE	ug/Kg	163	J	119	J	139	J	793	U
CAPROLACTAM	ug/Kg	444	U	433	U	500	U	793	U
CARBAZOLE	ug/Kg	444	U	433	U	500	U	793	U
CHRYSENE	ug/Kg	444	U	433	U	500	U	793	U
CRESOLS, m & p	ug/Kg								
DI-n-BUTYL PHTHALATE	ug/Kg	444	U	433	U	500	U	793	U
DI-n-OCTYLPHTHALATE	ug/Kg	444	U	433	U	500	U	793	U
DIBENZ(a,h)ANTHRACENE	ug/Kg	444	U	433	U	500	U	793	U
DIBENZOFURAN	ug/Kg	444	U	433	U	500	U	793	U
DIETHYL PHTHALATE	ug/Kg	444	U	433	U	500	U	793	U
DIMETHYL PHTHALATE	ug/Kg	444	U	433	U	500	U	793	U
FLUORANTHENE	ug/Kg	444	U	433	U	500	U	793	U
FLUORENE	ug/Kg	444	U	433	U	500	U	793	U
HEXACHLOROBENZENE	ug/Kg	444	U	433	U	500	U	793	U
HEXACHLOROBUTADIENE	ug/Kg	444	U	433	U	500	U	793	U
HEXACHLOROCYCLOPENTADIENE	ug/Kg	444	U	433	U	500	U	793	U
HEXACHLOROETHANE	ug/Kg	444	U	433	U	500	U	793	R
INDENO(1,2,3-c,d)PYRENE	ug/Kg	444	U	433	U	500	U	793	UJ
ISOPHORONE	ug/Kg	444	U	433	U	500	U	793	U
N-NITROSODI-n-PROPYLAMINE	ug/Kg	444	U	433	U	500	U	793	U
N-NITROSODIPHENYLAMINE	ug/Kg	444	U	433	U	500	U	793	U
NAPHTHALENE	ug/Kg	444	U	433	U	500	U	793	R
NITROBENZENE	ug/Kg	444	U	433	U	500	U	793	U
PENTACHLOROPHENOL	ug/Kg	1330	U	1300	U	1500	U	2380	U
PHENANTHRENE	ug/Kg	444	U	433	U	500	U	793	U
PHENOL	ug/Kg	444	U	433	U	500	U	793	U
PYRENE	ug/Kg	30.7	J	433	U	500	U	793	U

Analytical Data Summary

Parameter	Units	StationID		NDW06SD08		NDW06SD09		NDW06SD10	
		SampleID		NDW06SD08-R01		NDW06SD09-R01		NDW06SD10-R01	
		Date Collected		09/04/03		09/04/03		09/04/03	
		SampleType		N		N		N	
BENZO(k)FLUORANTHENE	ug/Kg	1050	U	1060	U	880	U	408	U
BENZYL BUTYL PHTHALATE	ug/Kg	1050	U	1060	U	880	U	408	U
BIPHENYL (DIPHENYL)	ug/Kg	1050	U	1060	U	880	U	408	U
bis(2-CHLOROETHOXY) METHANE	ug/Kg	1050	R	1060	R	880	R	408	R
bis(2-CHLOROETHYL) ETHER (2-CHLOROETHYL ETHER)	ug/Kg	1050	U	1060	U	880	U	408	U
bis(2-CHLOROISOPROPYL) ETHER	ug/Kg	1050	U	1060	U	880	U	408	U
bis(2-ETHYLHEXYL) PHTHALATE	ug/Kg	1050	U	1060	U	880	U	408	U
CAPROLACTAM	ug/Kg	1050	U	1060	U	880	U	408	U
CARBAZOLE	ug/Kg	1050	U	1060	U	880	U	408	U
CHRYSENE	ug/Kg	1050	U	1060	U	880	U	408	U
CRESOLS, m & p	ug/Kg								
DI-n-BUTYL PHTHALATE	ug/Kg	1050	U	1060	U	880	U	408	U
DI-n-OCTYLPHTHALATE	ug/Kg	1050	U	1060	U	880	U	408	U
DIBENZ(a,h)ANTHRACENE	ug/Kg	1050	U	1060	U	880	U	408	U
DIBENZOFURAN	ug/Kg	1050	U	1060	U	880	U	408	U
DIETHYL PHTHALATE	ug/Kg	1050	U	1060	U	880	U	408	U
DIMETHYL PHTHALATE	ug/Kg	1050	U	1060	U	880	U	408	U
FLUORANTHENE	ug/Kg	1050	U	1060	U	880	U	408	U
FLUORENE	ug/Kg	1050	U	1060	U	880	U	408	U
HEXACHLOROBENZENE	ug/Kg	1050	U	1060	U	880	U	408	U
HEXACHLOROBUTADIENE	ug/Kg	1050	U	1060	U	880	U	408	U
HEXACHLOROCYCLOPENTADIENE	ug/Kg	1050	U	1060	U	880	U	408	U
HEXACHLOROETHANE	ug/Kg	1050	R	1060	R	880	R	408	R
INDENO(1,2,3-c,d)PYRENE	ug/Kg	1050	UJ	1060	UJ	880	UJ	408	UJ
ISOPHORONE	ug/Kg	1050	U	1060	U	880	U	408	U
N-NITROSODI-n-PROPYLAMINE	ug/Kg	1050	U	1060	U	880	U	408	U
N-NITROSODIPHENYLAMINE	ug/Kg	1050	U	1060	U	880	U	408	U
NAPHTHALENE	ug/Kg	1050	R	1060	R	880	R	408	R
NITROBENZENE	ug/Kg	1050	U	1060	U	880	U	408	U
PENTACHLOROPHENOL	ug/Kg	3140	U	3180	U	2640	U	1220	U
PHENANTHRENE	ug/Kg	1050	U	1060	U	880	U	408	U
PHENOL	ug/Kg	1050	U	1060	U	880	U	408	U
PYRENE	ug/Kg	1050	U	1060	U	880	U	408	U

Analytical Data Summary

	StationID	NDW06SD12		NDW06SD15		NDW06SD16	
	SampleID	NDW06SD12-R01		NDW06SD15K-R01		NDW06SD16K-R01	
	Date Collected	09/04/03		09/05/03		09/05/03	
	SampleType	N		N		N	
Parameter	Units						
BENZO(k)FLUORANTHENE	ug/Kg	78.4	J	800	U	816	U
BENZYL BUTYL PHTHALATE	ug/Kg	512	U	800	U	816	U
BIPHENYL (DIPHENYL)	ug/Kg	512	U	800	U	816	U
bis(2-CHLOROETHOXY) METHANE	ug/Kg	512	R	800	R	816	R
bis(2-CHLOROETHYL) ETHER (2-CHLOROETHYL ETHER)	ug/Kg	512	U	800	U	816	U
bis(2-CHLOROISOPROPYL) ETHER	ug/Kg	512	U	800	U	816	U
bis(2-ETHYLHEXYL) PHTHALATE	ug/Kg	512	U	800	U	816	U
CAPROLACTAM	ug/Kg	512	U	800	U	816	U
CARBAZOLE	ug/Kg	512	U	800	U	816	U
CHRYSENE	ug/Kg	68	J	800	U	816	U
CRESOLS, m & p	ug/Kg						
DI-n-BUTYL PHTHALATE	ug/Kg	512	U	800	U	816	U
DI-n-OCTYLPHTHALATE	ug/Kg	512	U	800	U	816	U
DIBENZ(a,h)ANTHRACENE	ug/Kg	512	U	800	U	816	U
DIBENZOFURAN	ug/Kg	512	U	800	U	816	U
DIETHYL PHTHALATE	ug/Kg	512	U	800	U	816	U
DIMETHYL PHTHALATE	ug/Kg	512	U	800	U	816	U
FLUORANTHENE	ug/Kg	36.3	J	800	U	816	U
FLUORENE	ug/Kg	512	U	800	U	816	U
HEXACHLOROBENZENE	ug/Kg	512	U	800	U	816	U
HEXACHLOROBUTADIENE	ug/Kg	512	U	800	U	816	U
HEXACHLOROCYCLOPENTADIENE	ug/Kg	512	U	800	U	816	U
HEXACHLOROETHANE	ug/Kg	512	R	800	R	816	R
INDENO(1,2,3-c,d)PYRENE	ug/Kg	512	UJ	800	UJ	816	UJ
ISOPHORONE	ug/Kg	512	U	800	U	816	U
N-NITROSODI-n-PROPYLAMINE	ug/Kg	512	U	800	U	816	U
N-NITROSODIPHENYLAMINE	ug/Kg	512	U	800	U	816	U
NAPHTHALENE	ug/Kg	512	R	800	R	816	R
NITROBENZENE	ug/Kg	512	U	800	U	816	U
PENTACHLOROPHENOL	ug/Kg	1540	U	2400	R	2450	R
PHENANTHRENE	ug/Kg	512	U	800	U	816	U
PHENOL	ug/Kg	512	U	800	U	816	U
PYRENE	ug/Kg	50.4	J	800	U	816	U

Analytical Data Summary

	StationID	W6-SD01		W6-SD02		W6-SD03		W6-SD03	
	SampleID	NDA042		NDA043		NDA044		NDA307FD1	
	Date Collected	04/13/00		04/13/00		04/13/00		04/13/00	
	SampleType	N		N		N		FD	
Parameter	Units								
ACETONE	ug/Kg	37	R	36	R	140	R	145	R
BROMODICHLOROMETHANE	ug/Kg	12	U	11	U	59	U	56	U
BROMOMETHANE	ug/Kg	12	U	11	U	59	U	56	U
BENZENE	ug/Kg	12	U	11	U	59	U	56	U
TOLUENE	ug/Kg	12	U	11	U	3	J	19	J
CARBON DISULFIDE	ug/Kg	3	J	3	J	22	J	22	J
METHYLCYCLOHEXANE	ug/Kg								
CHLOROBENZENE	ug/Kg	12	U	11	U	59	U	56	U
CHLOROETHANE	ug/Kg	12	U	11	U	59	U	56	U
CHLOROMETHANE	ug/Kg	12	U	11	U	59	U	56	U
CARBON TETRACHLORIDE	ug/Kg	12	U	11	U	59	U	56	U
CYCLOHEXANE	ug/Kg								
DIBROMOCHLOROMETHANE	ug/Kg	12	U	11	U	59	U	56	U
1,2-DIBROMO-3-CHLOROPROPANE	ug/Kg								
1,1-DICHLOROETHANE	ug/Kg	12	U	11	U	59	U	56	U
1,2-DICHLOROETHANE	ug/Kg	12	U	11	U	59	U	56	U
1,2-DICHLOROBENZENE	ug/Kg								
1,3-DICHLOROBENZENE	ug/Kg								
1,4-DICHLOROBENZENE	ug/Kg								
1,1-DICHLOROETHENE	ug/Kg	12	U	11	U	59	U	56	U
cis-1,2-DICHLOROETHYLENE	ug/Kg								
trans-1,2-DICHLOROETHENE	ug/Kg								
cis-1,3-DICHLOROPROPENE	ug/Kg	12	U	11	U	59	U	56	U
trans-1,3-DICHLOROPROPENE	ug/Kg	12	U	11	U	59	U	56	U
1,2-DICHLOROPROPANE	ug/Kg	12	U	11	U	59	U	56	U
ETHYLBENZENE	ug/Kg	12	U	11	U	2	U	18	J
1,2-DIBROMOETHANE (ETHYLENE DIB	ug/Kg								
TRICHLOROFLUOROMETHANE	ug/Kg								
1,1,2-TRICHLORO-1,2,2-TRIFLUOROET	ug/Kg								
DICHLORODIFLUOROMETHANE	ug/Kg								
2-HEXANONE	ug/Kg	12	U	11	U	59	U	56	U
ISOPROPYLBENZENE (CUMENE)	ug/Kg								
METHYL ACETATE	ug/Kg								
METHYL ETHYL KETONE (2-BUTANON	ug/Kg	4	J	4	J	17	J	20	J
METHYL ISOBUTYL KETONE (4-METHY	ug/Kg	12	U	11	U	59	U	56	U
METHYLENE CHLORIDE	ug/Kg	12	U	11	U	59	U	56	U
1,1,2,2-TETRACHLOROETHANE	ug/Kg	12	U	11	U	59	U	56	U

Analytical Data Summary

	StationID	W6-SD04		W6-SD05		W6-SD06		W6-SD07	
	SampleID	NDA045		NDA046		NDA302		NDA303	
	Date Collected	04/13/00		04/13/00		04/13/00		04/13/00	
	SampleType	N		N		N		N	
Parameter	Units								
ACETONE	ug/Kg	70	R	97	R	41	R	100	R
BROMODICHLOROMETHANE	ug/Kg	36	UJ	43	UJ	26	UJ	47	UJ
BROMOMETHANE	ug/Kg	36	UJ	43	UJ	26	UJ	47	UJ
BENZENE	ug/Kg	36	UJ	43	UJ	26	UJ	47	UJ
TOLUENE	ug/Kg	3	J	3	J	26	UJ	3	J
CARBON DISULFIDE	ug/Kg	13	J	15	J	8	J	20	J
METHYLCYCLOHEXANE	ug/Kg								
CHLOROBENZENE	ug/Kg	36	UJ	43	UJ	26	UJ	47	UJ
CHLOROETHANE	ug/Kg	36	UJ	43	UJ	26	UJ	47	UJ
CHLOROMETHANE	ug/Kg	36	UJ	43	UJ	26	UJ	47	UJ
CARBON TETRACHLORIDE	ug/Kg	36	UJ	43	UJ	26	UJ	47	UJ
CYCLOHEXANE	ug/Kg								
DIBROMOCHLOROMETHANE	ug/Kg	36	UJ	43	UJ	26	UJ	47	UJ
1,2-DIBROMO-3-CHLOROPROPANE	ug/Kg								
1,1-DICHLOROETHANE	ug/Kg	36	UJ	43	UJ	26	UJ	47	UJ
1,2-DICHLOROETHANE	ug/Kg	36	UJ	43	UJ	26	UJ	47	UJ
1,2-DICHLOROBENZENE	ug/Kg								
1,3-DICHLOROBENZENE	ug/Kg								
1,4-DICHLOROBENZENE	ug/Kg								
1,1-DICHLOROETHENE	ug/Kg	36	UJ	43	UJ	26	UJ	47	UJ
cis-1,2-DICHLOROETHYLENE	ug/Kg								
trans-1,2-DICHLOROETHENE	ug/Kg								
cis-1,3-DICHLOROPROPENE	ug/Kg	36	UJ	43	UJ	26	UJ	47	UJ
trans-1,3-DICHLOROPROPENE	ug/Kg	36	UJ	43	UJ	26	UJ	47	UJ
1,2-DICHLOROPROPANE	ug/Kg	36	UJ	43	UJ	26	UJ	47	UJ
ETHYLBENZENE	ug/Kg	1	J	2	J	26	UJ	1	J
1,2-DIBROMOETHANE (ETHYLENE DIB	ug/Kg								
TRICHLOROFLUOROMETHANE	ug/Kg								
1,1,2-TRICHLORO-1,2,2-TRIFLUOROET	ug/Kg								
DICHLORODIFLUOROMETHANE	ug/Kg								
2-HEXANONE	ug/Kg	36	UJ	43	UJ	26	UJ	47	UJ
ISOPROPYLBENZENE (CUMENE)	ug/Kg								
METHYL ACETATE	ug/Kg								
METHYL ETHYL KETONE (2-BUTANON	ug/Kg	36	R	12	J	26	R	12	J
METHYL ISOBUTYL KETONE (4-METHY	ug/Kg	36	UJ	43	UJ	26	UJ	47	UJ
METHYLENE CHLORIDE	ug/Kg	36	UJ	43	UJ	26	UJ	47	UJ
1,1,2,2-TETRACHLOROETHANE	ug/Kg	36	UJ	43	UJ	26	UJ	47	UJ

Analytical Data Summary

	StationID	NDW06SD02		NDW06SD02		NDW06SD03		NDW06SD05	
	SampleID	NDW06FD03P-R01		NDW06SD02-R01		NDW06SD03-R01		NDW06SD05-R01	
	Date Collected	09/03/03		09/03/03		09/03/03		09/03/03	
	SampleType	FD		N		N		N	
Parameter	Units								
ACETONE	ug/Kg	91.8	UJ	268	J	315	J	126	UJ
BROMODICHLOROMETHANE	ug/Kg	14.5	U	17.5	U	15.1	U	52.6	U
BROMOMETHANE	ug/Kg	14.5	U	17.5	U	15.1	U	52.6	U
BENZENE	ug/Kg	14.5	U	17.5	U	15.1	U	52.6	U
TOLUENE	ug/Kg	14.5	U	17.5	U	15.1	U	52.6	U
CARBON DISULFIDE	ug/Kg	14.5	U	17.5	U	1	J	4.8	J
METHYLCYCLOHEXANE	ug/Kg	14.5	U	17.5	U	15.1	U	52.6	U
CHLOROBENZENE	ug/Kg	14.5	U	17.5	U	15.1	U	52.6	U
CHLOROETHANE	ug/Kg	14.5	U	17.5	U	15.1	U	52.6	U
CHLOROMETHANE	ug/Kg	14.5	U	17.5	U	15.1	U	52.6	U
CARBON TETRACHLORIDE	ug/Kg	14.5	U	17.5	U	15.1	U	52.6	U
CYCLOHEXANE	ug/Kg	14.5	U	17.5	U	15.1	U	52.6	U
DIBROMOCHLOROMETHANE	ug/Kg	14.5	U	17.5	U	15.1	U	52.6	U
1,2-DIBROMO-3-CHLOROPROPANE	ug/Kg	14.5	U	17.5	U	15.1	U	52.6	U
1,1-DICHLOROETHANE	ug/Kg	14.5	U	17.5	U	15.1	U	52.6	U
1,2-DICHLOROETHANE	ug/Kg	14.5	U	17.5	U	15.1	U	52.6	U
1,2-DICHLOROBENZENE	ug/Kg	14.5	U	17.5	U	15.1	U	52.6	U
1,3-DICHLOROBENZENE	ug/Kg	14.5	U	17.5	U	15.1	U	52.6	U
1,4-DICHLOROBENZENE	ug/Kg	14.5	U	17.5	U	15.1	U	52.6	U
1,1-DICHLOROETHENE	ug/Kg	14.5	U	17.5	U	15.1	U	52.6	U
cis-1,2-DICHLOROETHYLENE	ug/Kg	14.5	U	17.5	U	15.1	U	52.6	U
trans-1,2-DICHLOROETHENE	ug/Kg	14.5	U	17.5	U	15.1	U	52.6	U
cis-1,3-DICHLOROPROPENE	ug/Kg	14.5	U	17.5	U	15.1	U	52.6	U
trans-1,3-DICHLOROPROPENE	ug/Kg	14.5	U	17.5	U	15.1	U	52.6	U
1,2-DICHLOROPROPANE	ug/Kg	14.5	U	17.5	U	15.1	U	52.6	U
ETHYLBENZENE	ug/Kg	14.5	U	17.5	U	15.1	U	52.6	U
1,2-DIBROMOETHANE (ETHYLENE DIB	ug/Kg	14.5	U	17.5	U	15.1	U	52.6	U
TRICHLOROFLUOROMETHANE	ug/Kg	14.5	U	17.5	U	15.1	U	52.6	U
1,1,2-TRICHLORO-1,2,2-TRIFLUOROET	ug/Kg	14.5	U	17.5	U	15.1	U	52.6	U
DICHLORODIFLUOROMETHANE	ug/Kg	14.5	U	17.5	U	15.1	U	52.6	U
2-HEXANONE	ug/Kg	14.5	U	17.5	U	15.1	U	52.6	U
ISOPROPYLBENZENE (CUMENE)	ug/Kg	14.5	U	17.5	U	15.1	U	52.6	U
METHYL ACETATE	ug/Kg	14.5	U	17.5	U	15.1	U	52.6	U
METHYL ETHYL KETONE (2-BUTANON	ug/Kg	14.5	U	17.5	U	15.1	U	52.6	U
METHYL ISOBUTYL KETONE (4-METHY	ug/Kg	14.5	U	17.5	U	15.1	U	52.6	U
METHYLENE CHLORIDE	ug/Kg	0.97	J	1.2	J	0.99	J	2.8	J
1,1,2,2-TETRACHLOROETHANE	ug/Kg	14.5	U	17.5	U	15.1	U	52.6	U

Analytical Data Summary

	StationID	NDW06SD11		NDW06SD13		NDW06SD14		NDW06SD06	
	SampleID	NDW06SD11-R01		NDW06SD13-R01		NDW06SD14-R01		NDW06SD06-R01	
	Date Collected	09/03/03		09/03/03		09/03/03		09/04/03	
	SampleType	N		N		N		N	
Parameter	Units								
ACETONE	ug/Kg	114	UJ	58.7	UJ	604	J	439	U
BROMODICHLOROMETHANE	ug/Kg	14	U	13.4	U	15.5	U	46.7	U
BROMOMETHANE	ug/Kg	14	U	13.4	U	15.5	U	46.7	U
BENZENE	ug/Kg	14	U	13.4	U	15.5	U	46.7	U
TOLUENE	ug/Kg	14	U	13.4	U	15.5	U	46.7	U
CARBON DISULFIDE	ug/Kg	0.8	J	13.4	U	15.5	U	46.7	U
METHYLCYCLOHEXANE	ug/Kg	14	U	13.4	U	15.5	U	46.7	U
CHLOROBENZENE	ug/Kg	14	U	13.4	U	15.5	U	46.7	U
CHLOROETHANE	ug/Kg	14	U	13.4	U	15.5	U	46.7	U
CHLOROMETHANE	ug/Kg	14	U	13.4	U	15.5	U	46.7	U
CARBON TETRACHLORIDE	ug/Kg	14	U	13.4	U	15.5	U	46.7	U
CYCLOHEXANE	ug/Kg	14	U	13.4	U	15.5	U	46.7	U
DIBROMOCHLOROMETHANE	ug/Kg	14	U	13.4	U	15.5	U	46.7	U
1,2-DIBROMO-3-CHLOROPROPANE	ug/Kg	14	U	13.4	U	15.5	U	46.7	U
1,1-DICHLOROETHANE	ug/Kg	14	U	13.4	U	15.5	U	46.7	U
1,2-DICHLOROETHANE	ug/Kg	14	U	13.4	U	15.5	U	46.7	U
1,2-DICHLOROBENZENE	ug/Kg	14	U	13.4	U	15.5	U	46.7	U
1,3-DICHLOROBENZENE	ug/Kg	14	U	13.4	U	15.5	U	46.7	U
1,4-DICHLOROBENZENE	ug/Kg	14	U	13.4	U	15.5	U	46.7	U
1,1-DICHLOROETHENE	ug/Kg	14	U	13.4	U	15.5	U	46.7	U
cis-1,2-DICHLOROETHYLENE	ug/Kg	14	U	13.4	U	15.5	U	46.7	U
trans-1,2-DICHLOROETHENE	ug/Kg	14	U	13.4	U	15.5	U	46.7	U
cis-1,3-DICHLOROPROPENE	ug/Kg	14	U	13.4	U	15.5	U	46.7	U
trans-1,3-DICHLOROPROPENE	ug/Kg	14	U	13.4	U	15.5	U	46.7	U
1,2-DICHLOROPROPANE	ug/Kg	14	U	13.4	U	15.5	U	46.7	U
ETHYLBENZENE	ug/Kg	14	U	13.4	U	15.5	U	46.7	U
1,2-DIBROMOETHANE (ETHYLENE DIB	ug/Kg	14	U	13.4	U	15.5	U	46.7	U
TRICHLOROFLUOROMETHANE	ug/Kg	14	U	13.4	U	15.5	U	46.7	U
1,1,2-TRICHLORO-1,2,2-TRIFLUOROET	ug/Kg	14	U	13.4	U	15.5	U	46.7	U
DICHLORODIFLUOROMETHANE	ug/Kg	14	U	13.4	U	15.5	U	46.7	U
2-HEXANONE	ug/Kg	14	U	13.4	U	15.5	U	46.7	U
ISOPROPYLBENZENE (CUMENE)	ug/Kg	14	U	13.4	U	15.5	U	46.7	U
METHYL ACETATE	ug/Kg	14	U	13.4	U	15.5	U	46.7	U
METHYL ETHYL KETONE (2-BUTANON	ug/Kg	14	U	13.4	U	15.5	U	46.7	U
METHYL ISOBUTYL KETONE (4-METHY	ug/Kg	14	U	13.4	U	15.5	U	46.7	U
METHYLENE CHLORIDE	ug/Kg	0.86	J	0.94	J	0.77	J	6.3	J
1,1,2,2-TETRACHLOROETHANE	ug/Kg	14	U	13.4	U	15.5	U	46.7	U

Analytical Data Summary

	StationID	NDW06SD07		NDW06SD08		NDW06SD09		NDW06SD10	
	SampleID	NDW06SD07-R01		NDW06SD08-R01		NDW06SD09-R01		NDW06SD10-R01	
	Date Collected	09/04/03		09/04/03		09/04/03		09/04/03	
	SampleType	N		N		N		N	
Parameter	Units								
ACETONE	ug/Kg	68.2	U	52.5	UJ	41.2	U	10.9	UJ
BROMODICHLOROMETHANE	ug/Kg	59.7	U	52.5	U	37.1	U	10.9	U
BROMOMETHANE	ug/Kg	59.7	U	52.5	U	37.1	U	10.9	U
BENZENE	ug/Kg	59.7	U	52.5	U	37.1	U	10.9	U
TOLUENE	ug/Kg	59.7	U	52.5	U	37.1	U	10.9	U
CARBON DISULFIDE	ug/Kg	3.9	J	52.5	U	4.4	J	10.9	U
METHYLCYCLOHEXANE	ug/Kg	59.7	U	52.5	U	37.1	U	10.9	U
CHLOROBENZENE	ug/Kg	59.7	U	52.5	U	37.1	U	10.9	U
CHLOROETHANE	ug/Kg	59.7	U	52.5	U	37.1	U	10.9	U
CHLOROMETHANE	ug/Kg	59.7	U	52.5	U	37.1	U	10.9	U
CARBON TETRACHLORIDE	ug/Kg	59.7	U	52.5	U	37.1	U	10.9	U
CYCLOHEXANE	ug/Kg	59.7	U	52.5	UJ	37.1	U	10.9	U
DIBROMOCHLOROMETHANE	ug/Kg	59.7	U	52.5	U	37.1	U	10.9	U
1,2-DIBROMO-3-CHLOROPROPANE	ug/Kg	59.7	U	52.5	U	37.1	U	10.9	U
1,1-DICHLOROETHANE	ug/Kg	59.7	U	52.5	U	37.1	U	10.9	U
1,2-DICHLOROETHANE	ug/Kg	59.7	U	52.5	U	37.1	U	10.9	U
1,2-DICHLOROBENZENE	ug/Kg	59.7	U	52.5	U	37.1	U	10.9	U
1,3-DICHLOROBENZENE	ug/Kg	59.7	U	52.5	U	37.1	U	10.9	U
1,4-DICHLOROBENZENE	ug/Kg	59.7	U	52.5	U	37.1	U	10.9	U
1,1-DICHLOROETHENE	ug/Kg	59.7	U	52.5	U	37.1	U	10.9	U
cis-1,2-DICHLOROETHYLENE	ug/Kg	59.7	U	52.5	U	37.1	U	10.9	U
trans-1,2-DICHLOROETHENE	ug/Kg	59.7	U	52.5	U	37.1	U	10.9	U
cis-1,3-DICHLOROPROPENE	ug/Kg	59.7	U	52.5	U	37.1	U	10.9	U
trans-1,3-DICHLOROPROPENE	ug/Kg	59.7	U	52.5	U	37.1	U	10.9	U
1,2-DICHLOROPROPANE	ug/Kg	59.7	U	52.5	U	37.1	U	10.9	U
ETHYLBENZENE	ug/Kg	59.7	U	52.5	U	37.1	U	10.9	U
1,2-DIBROMOETHANE (ETHYLENE DIB	ug/Kg	59.7	U	52.5	U	37.1	U	10.9	U
TRICHLOROFLUOROMETHANE	ug/Kg	59.7	U	52.5	U	37.1	U	10.9	U
1,1,2-TRICHLORO-1,2,2-TRIFLUOROET	ug/Kg	59.7	U	52.5	U	37.1	U	10.9	U
DICHLORODIFLUOROMETHANE	ug/Kg	59.7	U	52.5	U	37.1	U	10.9	U
2-HEXANONE	ug/Kg	59.7	U	52.5	U	37.1	U	10.9	U
ISOPROPYLBENZENE (CUMENE)	ug/Kg	59.7	U	52.5	U	37.1	U	10.9	U
METHYL ACETATE	ug/Kg	59.7	U	52.5	U	37.1	U	10.9	U
METHYL ETHYL KETONE (2-BUTANON	ug/Kg	59.7	U	52.5	U	37.1	U	10.9	U
METHYL ISOBUTYL KETONE (4-METHY	ug/Kg	59.7	U	52.5	U	37.1	U	10.9	U
METHYLENE CHLORIDE	ug/Kg	8.2	J	3.9	J	5	J	1.3	J
1,1,2,2-TETRACHLOROETHANE	ug/Kg	59.7	U	52.5	U	37.1	U	10.9	U

Analytical Data Summary

	StationID	NDW06SD12		NDW06SD15		NDW06SD16	
	SampleID	NDW06SD12-R01		NDW06SD15K-R01		NDW06SD16K-R01	
	Date Collected	09/04/03		09/05/03		09/05/03	
	SampleType	N		N		N	
Parameter	Units						
ACETONE	ug/Kg	86.1	U	37.6	UJ	40	UJ
BROMODICHLOROMETHANE	ug/Kg	14.9	U	37.6	U	40	U
BROMOMETHANE	ug/Kg	14.9	U	37.6	U	40	U
BENZENE	ug/Kg	14.9	U	37.6	U	40	U
TOLUENE	ug/Kg	14.9	U	37.6	U	40	U
CARBON DISULFIDE	ug/Kg	14.9	U	37.6	U	40	U
METHYLCYCLOHEXANE	ug/Kg	14.9	U	37.6	U	40	U
CHLOROBENZENE	ug/Kg	14.9	U	37.6	U	40	U
CHLOROETHANE	ug/Kg	14.9	U	37.6	U	40	U
CHLOROMETHANE	ug/Kg	14.9	U	37.6	U	40	U
CARBON TETRACHLORIDE	ug/Kg	14.9	U	37.6	U	40	U
CYCLOHEXANE	ug/Kg	14.9	UJ	37.6	UJ	40	UJ
DIBROMOCHLOROMETHANE	ug/Kg	14.9	U	37.6	U	40	U
1,2-DIBROMO-3-CHLOROPROPANE	ug/Kg	14.9	U	37.6	U	40	U
1,1-DICHLOROETHANE	ug/Kg	14.9	U	37.6	U	40	U
1,2-DICHLOROETHANE	ug/Kg	14.9	U	37.6	U	40	U
1,2-DICHLOROBENZENE	ug/Kg	14.9	U	37.6	U	40	U
1,3-DICHLOROBENZENE	ug/Kg	14.9	U	37.6	U	40	U
1,4-DICHLOROBENZENE	ug/Kg	14.9	U	37.6	U	40	U
1,1-DICHLOROETHENE	ug/Kg	14.9	U	37.6	U	40	U
cis-1,2-DICHLOROETHYLENE	ug/Kg	14.9	U	37.6	U	40	U
trans-1,2-DICHLOROETHENE	ug/Kg	14.9	U	37.6	U	40	U
cis-1,3-DICHLOROPROPENE	ug/Kg	14.9	U	37.6	U	40	U
trans-1,3-DICHLOROPROPENE	ug/Kg	14.9	U	37.6	U	40	U
1,2-DICHLOROPROPANE	ug/Kg	14.9	U	37.6	U	40	U
ETHYLBENZENE	ug/Kg	14.9	U	37.6	U	40	U
1,2-DIBROMOETHANE (ETHYLENE DIB	ug/Kg	14.9	U	37.6	U	40	U
TRICHLOROFLUOROMETHANE	ug/Kg	14.9	U	37.6	U	40	U
1,1,2-TRICHLORO-1,2,2-TRIFLUOROET	ug/Kg	14.9	U	37.6	U	40	U
DICHLORODIFLUOROMETHANE	ug/Kg	14.9	U	37.6	U	40	U
2-HEXANONE	ug/Kg	14.9	U	37.6	U	40	U
ISOPROPYLBENZENE (CUMENE)	ug/Kg	14.9	U	37.6	U	40	U
METHYL ACETATE	ug/Kg	14.9	U	37.6	U	40	U
METHYL ETHYL KETONE (2-BUTANON	ug/Kg	14.9	U	37.6	U	40	U
METHYL ISOBUTYL KETONE (4-METHY	ug/Kg	14.9	U	37.6	U	40	U
METHYLENE CHLORIDE	ug/Kg	2	J	37.6	U	40	U
1,1,2,2-TETRACHLOROETHANE	ug/Kg	14.9	U	37.6	U	40	U

Analytical Data Summary

	StationID	W6-SD01		W6-SD02		W6-SD03		W6-SD03	
	SampleID	NDA042		NDA043		NDA044		NDA307FD1	
	Date Collected	04/13/00		04/13/00		04/13/00		04/13/00	
	SampleType	N		N		N		FD	
Parameter	Units								
TETRACHLOROETHYLENE(PCE)	ug/Kg	12	U	11	U	59	U	56	U
STYRENE	ug/Kg	12	U	11	U	59	U	56	U
BROMOFORM	ug/Kg	12	U	11	U	59	U	56	U
tert-BUTYL METHYL ETHER	ug/Kg								
1,1,1-TRICHLOROETHANE	ug/Kg	12	U	11	U	59	U	56	U
1,1,2-TRICHLOROETHANE	ug/Kg	12	U	11	U	59	U	56	U
1,2,4-TRICHLOROBENZENE	ug/Kg								
TRICHLOROETHYLENE (TCE)	ug/Kg	12	U	11	U	59	U	56	U
CHLOROFORM	ug/Kg	12	U	11	U	59	U	56	U
VINYL CHLORIDE	ug/Kg	12	U	11	U	59	U	56	U
XYLENES, TOTAL	ug/Kg	0.3	J	11	U	16	J	133	=
M,P-XYLENE (SUM OF ISOMERS)	ug/Kg	0.3	J	11	U	13	J	104	=
O-XYLENE (1,2-DIMETHYLBENZENE)	ug/Kg	12	U	11	U	3	J	29	J

Analytical Data Summary

	StationID	W6-SD04		W6-SD05		W6-SD06		W6-SD07	
	SampleID	NDA045		NDA046		NDA302		NDA303	
	Date Collected	04/13/00		04/13/00		04/13/00		04/13/00	
	SampleType	N		N		N		N	
Parameter	Units								
TETRACHLOROETHYLENE(PCE)	ug/Kg	36	UJ	43	UJ	26	UJ	47	UJ
STYRENE	ug/Kg	36	UJ	43	UJ	26	UJ	47	UJ
BROMOFORM	ug/Kg	36	UJ	43	UJ	26	UJ	47	UJ
tert-BUTYL METHYL ETHER	ug/Kg								
1,1,1-TRICHLOROETHANE	ug/Kg	36	UJ	43	UJ	26	UJ	47	UJ
1,1,2-TRICHLOROETHANE	ug/Kg	36	UJ	43	UJ	26	UJ	47	UJ
1,2,4-TRICHLOROBENZENE	ug/Kg								
TRICHLOROETHYLENE (TCE)	ug/Kg	36	UJ	43	UJ	26	UJ	47	UJ
CHLOROFORM	ug/Kg	36	UJ	43	UJ	26	UJ	47	UJ
VINYL CHLORIDE	ug/Kg	36	UJ	43	UJ	26	UJ	47	UJ
XYLENES, TOTAL	ug/Kg	10	J	13	J	26	UJ	7	J
M,P-XYLENE (SUM OF ISOMERS)	ug/Kg	8	J	10	J	26	UJ	5	J
O-XYLENE (1,2-DIMETHYLBENZENE)	ug/Kg	2	J	3	J	26	UJ	2	J

Analytical Data Summary

	StationID	NDW06SD02		NDW06SD02		NDW06SD03		NDW06SD05	
	SampleID	NDW06FD03P-R01		NDW06SD02-R01		NDW06SD03-R01		NDW06SD05-R01	
	Date Collected	09/03/03		09/03/03		09/03/03		09/03/03	
	SampleType	FD		N		N		N	
Parameter	Units								
TETRACHLOROETHYLENE(PCE)	ug/Kg	14.5	U	17.5	U	15.1	U	52.6	U
STYRENE	ug/Kg	14.5	U	17.5	U	15.1	U	52.6	U
BROMOFORM	ug/Kg	14.5	U	17.5	U	15.1	U	52.6	U
tert-BUTYL METHYL ETHER	ug/Kg	14.5	U	17.5	U	15.1	U	52.6	U
1,1,1-TRICHLOROETHANE	ug/Kg	14.5	U	17.5	U	15.1	U	52.6	U
1,1,2-TRICHLOROETHANE	ug/Kg	14.5	U	17.5	U	15.1	U	52.6	U
1,2,4-TRICHLOROBENZENE	ug/Kg	14.5	U	17.5	U	15.1	U	52.6	U
TRICHLOROETHYLENE (TCE)	ug/Kg	14.5	U	17.5	U	15.1	U	52.6	U
CHLOROFORM	ug/Kg	14.5	U	17.5	U	15.1	U	52.6	U
VINYL CHLORIDE	ug/Kg	14.5	U	17.5	U	15.1	U	52.6	U
XYLENES, TOTAL	ug/Kg	14.5	U	17.5	U	15.1	U	52.6	U
M,P-XYLENE (SUM OF ISOMERS)	ug/Kg								
O-XYLENE (1,2-DIMETHYLBENZENE)	ug/Kg								

Analytical Data Summary

	StationID	NDW06SD11		NDW06SD13		NDW06SD14		NDW06SD06	
	SampleID	NDW06SD11-R01		NDW06SD13-R01		NDW06SD14-R01		NDW06SD06-R01	
	Date Collected	09/03/03		09/03/03		09/03/03		09/04/03	
	SampleType	N		N		N		N	
Parameter	Units								
TETRACHLOROETHYLENE(PCE)	ug/Kg	14	U	13.4	U	15.5	U	46.7	U
STYRENE	ug/Kg	14	U	13.4	U	15.5	U	46.7	U
BROMOFORM	ug/Kg	14	U	13.4	U	15.5	U	46.7	U
tert-BUTYL METHYL ETHER	ug/Kg	14	U	13.4	U	15.5	U	46.7	U
1,1,1-TRICHLOROETHANE	ug/Kg	14	U	13.4	U	15.5	U	46.7	U
1,1,2-TRICHLOROETHANE	ug/Kg	14	U	13.4	U	15.5	U	46.7	U
1,2,4-TRICHLOROBENZENE	ug/Kg	14	U	13.4	U	15.5	U	46.7	U
TRICHLOROETHYLENE (TCE)	ug/Kg	14	U	13.4	U	15.5	U	46.7	U
CHLOROFORM	ug/Kg	14	U	13.4	U	15.5	U	46.7	U
VINYL CHLORIDE	ug/Kg	14	U	13.4	U	15.5	U	46.7	U
XYLENES, TOTAL	ug/Kg	14	U	13.4	U	15.5	U	46.7	U
M,P-XYLENE (SUM OF ISOMERS)	ug/Kg								
O-XYLENE (1,2-DIMETHYLBENZENE)	ug/Kg								

Analytical Data Summary

	StationID	NDW06SD07		NDW06SD08		NDW06SD09		NDW06SD10	
	SampleID	NDW06SD07-R01		NDW06SD08-R01		NDW06SD09-R01		NDW06SD10-R01	
	Date Collected	09/04/03		09/04/03		09/04/03		09/04/03	
	SampleType	N		N		N		N	
Parameter	Units								
TETRACHLOROETHYLENE(PCE)	ug/Kg	59.7	U	52.5	U	37.1	U	10.9	U
STYRENE	ug/Kg	59.7	U	52.5	U	37.1	U	10.9	U
BROMOFORM	ug/Kg	59.7	U	52.5	U	37.1	U	10.9	U
tert-BUTYL METHYL ETHER	ug/Kg	59.7	U	52.5	U	37.1	U	10.9	U
1,1,1-TRICHLOROETHANE	ug/Kg	59.7	U	52.5	U	37.1	U	10.9	U
1,1,2-TRICHLOROETHANE	ug/Kg	59.7	U	52.5	U	37.1	U	10.9	U
1,2,4-TRICHLOROBENZENE	ug/Kg	59.7	U	52.5	U	37.1	U	10.9	U
TRICHLOROETHYLENE (TCE)	ug/Kg	59.7	U	52.5	U	37.1	U	10.9	U
CHLOROFORM	ug/Kg	59.7	U	52.5	U	37.1	U	10.9	U
VINYL CHLORIDE	ug/Kg	59.7	U	52.5	U	37.1	U	10.9	U
XYLENES, TOTAL	ug/Kg	59.7	U	52.5	U	37.1	U	10.9	U
M,P-XYLENE (SUM OF ISOMERS)	ug/Kg								
O-XYLENE (1,2-DIMETHYLBENZENE)	ug/Kg								

Analytical Data Summary

	StationID	NDW06SD12		NDW06SD15		NDW06SD16	
	SampleID	NDW06SD12-R01		NDW06SD15K-R01		NDW06SD16K-R01	
	Date Collected	09/04/03		09/05/03		09/05/03	
	SampleType	N		N		N	
Parameter	Units						
TETRACHLOROETHYLENE(PCE)	ug/Kg	14.9	U	37.6	U	40	U
STYRENE	ug/Kg	14.9	U	37.6	U	40	U
BROMOFORM	ug/Kg	14.9	U	37.6	U	40	U
tert-BUTYL METHYL ETHER	ug/Kg	14.9	U	37.6	U	40	U
1,1,1-TRICHLOROETHANE	ug/Kg	14.9	U	37.6	U	40	U
1,1,2-TRICHLOROETHANE	ug/Kg	14.9	U	37.6	U	40	U
1,2,4-TRICHLOROBENZENE	ug/Kg	14.9	U	37.6	U	40	U
TRICHLOROETHYLENE (TCE)	ug/Kg	14.9	U	37.6	U	40	U
CHLOROFORM	ug/Kg	14.9	U	37.6	U	40	U
VINYL CHLORIDE	ug/Kg	14.9	U	37.6	U	40	U
XYLENES, TOTAL	ug/Kg	14.9	U	37.6	U	40	U
M,P-XYLENE (SUM OF ISOMERS)	ug/Kg						
O-XYLENE (1,2-DIMETHYLBENZENE)	ug/Kg						

I-2 Tables

Table I-2
Detected Chemicals in Surface Soil
SWMU 6, Naval Ammunition Support Detachment
SWMU 6 Former NASD, Vieques Island, Puerto Rico

Chemical	Station ID	Sample Date	Result	Qualifer	Region IX PRG [1]	Ecological Criteria [2]	SSL [3] (DAF=10)	Screening Criteria Exceedances		
								PRG	Ecological	SSL
Metals (mg/Kg)										
ALUMINUM	NDW06SS06	04/20/00	14000	=	7610	50	NA	yes	yes	na
	NDW06SS08	04/20/00	12200	=				yes	yes	na
	NDW06SS05	04/24/00	11600	=				yes	yes	na
	NDW06SS07	04/20/00	11100	=				yes	yes	na
	NDW06SS04	04/24/00	10900	=				yes	yes	na
	NDW06SS21	08/28/03	10300	=				yes	yes	na
	NDW06SS16	08/28/03	9330	=				yes	yes	na
	NDW06SS15	08/28/03	8240	=				yes	yes	na
	NDW06SS14	08/28/03	6890	=				no	yes	na
	NDW06SS17	08/28/03	6880	=				no	yes	na
	NDW06SS18	08/28/03	6530	=				no	yes	na
	NDW06SS19	08/28/03	5930	=				no	yes	na
	NDW06SS03	04/24/00	5810	=				no	yes	na
	NDW06SS13	08/28/03	5400	=				no	yes	na
	NDW06SS01	04/24/00	5170	=				no	yes	na
	NDW06SS02	04/24/00	4900	=				no	yes	na
	NDW06SS12	08/28/03	4670	=				no	yes	na
	NDW06SS22	08/28/03	4430	=				no	yes	na
	NDW06SS23	08/28/03	4400	=				no	yes	na
	NDW06SS09	08/28/03	3980	=				no	yes	na
	NDW06SS11	08/28/03	3600	=				no	yes	na
	NDW06SS20	08/28/03	3510	=				no	yes	na
	NDW06SS10	08/28/03	3470	=				no	yes	na
ANTIMONY	NDW06SS01	04/24/00	13.3	J	3.13	5	2.5	yes	yes	yes
	NDW06SS13	08/28/03	2.96	J				no	no	yes
	NDW06SS23	08/28/03	2.19	J				no	no	no
	NDW06SS03	04/24/00	1	J				no	no	no
	NDW06SS12	08/28/03	0.862	J				no	no	no
	NDW06SS05	04/24/00	0.82	J				no	no	no
	NDW06SS14	08/28/03	0.76	J				no	no	no
	NDW06SS06	04/20/00	0.74	J				no	no	no
	NDW06SS21	08/28/03	0.702	J				no	no	no
	NDW06SS09	08/28/03	0.606	J				no	no	no
	NDW06SS22	08/28/03	0.516	J				no	no	no
	NDW06SS04	04/24/00	0.47	J				no	no	no

Table I-2
Detected Chemicals in Surface Soil
SWMU 6, Naval Ammunition Support Detachment
SWMU 6 Former NASD, Vieques Island, Puerto Rico

Chemical	Station ID	Sample Date	Result	Qualifer	Region IX PRG [1]	Ecological Criteria [2]	SSL [3] (DAF=10)	Screening Criteria Exceedances		
								PRG	Ecological	SSL
	NDW06SS11	08/28/03	0.468	J				no	no	no
	NDW06SS10	08/28/03	0.465	J				no	no	no
	NDW06SS08	04/20/00	0.46	J				no	no	no
	NDW06SS19	08/28/03	0.448	J				no	no	no
	NDW06SS20	08/28/03	0.443	J				no	no	no
	NDW06SS07	04/20/00	0.34	J				no	no	no
	NDW06SS18	08/28/03	0.174	J				no	no	no
ARSENIC	NDW06SS23	08/28/03	7.9	J	0.39	10	14.5	yes	no	no
	NDW06SS01	04/24/00	7.6	=				yes	no	no
	NDW06SS13	08/28/03	3.09	J				yes	no	no
	NDW06SS02	04/24/00	1.9	J				yes	no	no
	NDW06SS03	04/24/00	1.6	J				yes	no	no
	NDW06SS05	04/24/00	1.5	J				yes	no	no
	NDW06SS10	08/28/03	1.48	J				yes	no	no
	NDW06SS09	08/28/03	1.32	J				yes	no	no
	NDW06SS16	08/28/03	1.17	J				yes	no	no
	NDW06SS14	08/28/03	1.12	J				yes	no	no
	NDW06SS07	04/20/00	1.1	J				yes	no	no
	NDW06SS19	08/28/03	1.01	J				yes	no	no
	NDW06SS06	04/20/00	1	J				yes	no	no
	NDW06SS08	04/20/00	0.99	J				yes	no	no
	NDW06SS22	08/28/03	0.963	J				yes	no	no
	NDW06SS04	04/24/00	0.93	J				yes	no	no
	NDW06SS15	08/28/03	0.912	J				yes	no	no
	NDW06SS21	08/28/03	0.765	J				yes	no	no
	NDW06SS18	08/28/03	0.635	J				yes	no	no
	NDW06SS12	08/28/03	0.623	J				yes	no	no
	NDW06SS17	08/28/03	0.598	J				yes	no	no
	NDW06SS20	08/28/03	0.566	J				yes	no	no
	NDW06SS11	08/28/03	0.48	J				yes	no	no
BARIUM	NDW06SS08	04/20/00	37.6	J	537	500	800	no	no	no
	NDW06SS04	04/24/00	36.1	J				no	no	no
	NDW06SS13	08/28/03	34	J				no	no	no
	NDW06SS06	04/20/00	29.5	J				no	no	no
	NDW06SS07	04/20/00	28.8	J				no	no	no
	NDW06SS03	04/24/00	26.5	J				no	no	no

Table I-2
Detected Chemicals in Surface Soil
SWMU 6, Naval Ammunition Support Detachment
SWMU 6 Former NASD, Vieques Island, Puerto Rico

Chemical	Station ID	Sample Date	Result	Qualifer	Region IX PRG [1]	Ecological Criteria [2]	SSL [3] (DAF=10)	Screening Criteria Exceedances		
								PRG	Ecological	SSL
	NDW06SS23	08/28/03	24.9	J				no	no	no
	NDW06SS01	04/24/00	19.3	J				no	no	no
	NDW06SS05	04/24/00	18.2	J				no	no	no
	NDW06SS09	08/28/03	16.5	J				no	no	no
	NDW06SS10	08/28/03	15.5	J				no	no	no
	NDW06SS21	08/28/03	13	J				no	no	no
	NDW06SS02	04/24/00	12.8	J				no	no	no
	NDW06SS22	08/28/03	12.4	J				no	no	no
	NDW06SS20	08/28/03	11.5	J				no	no	no
	NDW06SS12	08/28/03	9.28	J				no	no	no
	NDW06SS18	08/28/03	9.2	J				no	no	no
	NDW06SS11	08/28/03	8.52	J				no	no	no
	NDW06SS17	08/28/03	8.48	J				no	no	no
	NDW06SS19	08/28/03	8.47	J				no	no	no
	NDW06SS14	08/28/03	8.41	J				no	no	no
	NDW06SS15	08/28/03	8.25	J				no	no	no
	NDW06SS16	08/28/03	7.36	J				no	no	no
BERYLLIUM	NDW06SS04	04/24/00	0.12	J	15.4	10	31.5	no	no	no
	NDW06SS06	04/20/00	0.12	J				no	no	no
	NDW06SS16	08/28/03	0.111	J				no	no	no
	NDW06SS07	04/20/00	0.11	J				no	no	no
	NDW06SS08	04/20/00	0.11	J				no	no	no
	NDW06SS15	08/28/03	0.0968	J				no	no	no
	NDW06SS17	08/28/03	0.0809	J				no	no	no
	NDW06SS14	08/28/03	0.0759	J				no	no	no
	NDW06SS18	08/28/03	0.0735	J				no	no	no
	NDW06SS21	08/28/03	0.0725	J				no	no	no
	NDW06SS05	04/24/00	0.069	J				no	no	no
	NDW06SS23	08/28/03	0.068	J				no	no	no
	NDW06SS19	08/28/03	0.0648	J				no	no	no
	NDW06SS03	04/24/00	0.054	J				no	no	no
	NDW06SS13	08/28/03	0.0524	J				no	no	no
	NDW06SS20	08/28/03	0.0468	J				no	no	no
	NDW06SS22	08/28/03	0.046	J				no	no	no
	NDW06SS12	08/28/03	0.0437	J				no	no	no
	NDW06SS10	08/28/03	0.0398	J				no	no	no

Table I-2
Detected Chemicals in Surface Soil
SWMU 6, Naval Ammunition Support Detachment
SWMU 6 Former NASD, Vieques Island, Puerto Rico

Chemical	Station ID	Sample Date	Result	Qualifer	Region IX PRG [1]	Ecological Criteria [2]	SSL [3] (DAF=10)	Screening Criteria Exceedances		
								PRG	Ecological	SSL
	NDW06SS09	08/28/03	0.0362	J				no	no	no
	NDW06SS11	08/28/03	0.03	J				no	no	no
CADMIUM	NDW06SS04	04/24/00	1.4	=	3.7	0.4	4	no	yes	no
	NDW06SS23	08/28/03	0.767	J				no	yes	no
	NDW06SS05	04/24/00	0.61	J				no	yes	no
	NDW06SS13	08/28/03	0.471	J				no	yes	no
	NDW06SS19	08/28/03	0.47	J				no	yes	no
	NDW06SS02	04/24/00	0.35	J				no	no	no
	NDW06SS01	04/24/00	0.33	J				no	no	no
	NDW06SS08	04/20/00	0.23	J				no	no	no
	NDW06SS18	08/28/03	0.141	J				no	no	no
	NDW06SS14	08/28/03	0.0944	J				no	no	no
	NDW06SS12	08/28/03	0.0783	J				no	no	no
	NDW06SS22	08/28/03	0.0729	J				no	no	no
	NDW06SS09	08/28/03	0.0649	J				no	no	no
	NDW06SS17	08/28/03	0.0634	J				no	no	no
	NDW06SS21	08/28/03	0.0568	J				no	no	no
	NDW06SS15	08/28/03	0.0539	J				no	no	no
	NDW06SS20	08/28/03	0.048	J				no	no	no
	NDW06SS16	08/28/03	0.0445	J				no	no	no
	NDW06SS11	08/28/03	0.0367	J				no	no	no
	NDW06SS03	04/24/00	0.028	J				no	no	no
CALCIUM	NDW06SS20	08/28/03	165000	=	NA	NA	NA	na	na	na
	NDW06SS02	04/24/00	162000	J				na	na	na
	NDW06SS10	08/28/03	136000	=				na	na	na
	NDW06SS14	08/28/03	136000	=				na	na	na
	NDW06SS09	08/28/03	133000	=				na	na	na
	NDW06SS11	08/28/03	123000	=				na	na	na
	NDW06SS05	04/24/00	119000	J				na	na	na
	NDW06SS12	08/28/03	115000	=				na	na	na
	NDW06SS03	04/24/00	111000	J				na	na	na
	NDW06SS01	04/24/00	105000	J				na	na	na
	NDW06SS13	08/28/03	98300	=				na	na	na
	NDW06SS22	08/28/03	90700	=				na	na	na
	NDW06SS23	08/28/03	85000	=				na	na	na
	NDW06SS04	04/24/00	77800	J				na	na	na

Table I-2
Detected Chemicals in Surface Soil
SWMU 6, Naval Ammunition Support Detachment
SWMU 6 Former NASD, Vieques Island, Puerto Rico

Chemical	Station ID	Sample Date	Result	Qualifer	Region IX PRG [1]	Ecological Criteria [2]	SSL [3] (DAF=10)	Screening Criteria Exceedances PRG	Ecological	SSL
	NDW06SS15	08/28/03	73800	=				na	na	na
	NDW06SS18	08/28/03	72100	=				na	na	na
	NDW06SS19	08/28/03	70600	=				na	na	na
	NDW06SS08	04/20/00	69700	J				na	na	na
	NDW06SS07	04/20/00	68800	J				na	na	na
	NDW06SS21	08/28/03	64200	=				na	na	na
	NDW06SS16	08/28/03	50200	=				na	na	na
	NDW06SS17	08/28/03	48700	=				na	na	na
	NDW06SS06	04/20/00	35400	J				na	na	na
CHROMIUM, TOTAL	NDW06SS06	04/20/00	42.9	=	211	0.4	19	no	yes	yes
	NDW06SS07	04/20/00	35.7	=				no	yes	yes
	NDW06SS01	04/24/00	28	=				no	yes	yes
	NDW06SS23	08/28/03	25.8	=				no	yes	yes
	NDW06SS08	04/20/00	23.3	=				no	yes	yes
	NDW06SS21	08/28/03	16.7	=				no	yes	no
	NDW06SS05	04/24/00	14.9	=				no	yes	no
	NDW06SS04	04/24/00	14.3	=				no	yes	no
	NDW06SS03	04/24/00	12.9	=				no	yes	no
	NDW06SS13	08/28/03	12.7	=				no	yes	no
	NDW06SS16	08/28/03	7.86	=				no	yes	no
	NDW06SS14	08/28/03	6.99	=				no	yes	no
	NDW06SS19	08/28/03	6.67	=				no	yes	no
	NDW06SS15	08/28/03	6.57	=				no	yes	no
	NDW06SS02	04/24/00	6.4	=				no	yes	no
	NDW06SS17	08/28/03	5.93	=				no	yes	no
	NDW06SS18	08/28/03	5.82	=				no	yes	no
	NDW06SS22	08/28/03	5.71	=				no	yes	no
	NDW06SS10	08/28/03	5.48	=				no	yes	no
	NDW06SS12	08/28/03	5.3	=				no	yes	no
	NDW06SS09	08/28/03	5.18	=				no	yes	no
	NDW06SS20	08/28/03	4.1	=				no	yes	no
	NDW06SS11	08/28/03	3.07	=				no	yes	no
COBALT	NDW06SS06	04/20/00	12.8	=	903	20	NA	no	no	na
	NDW06SS07	04/20/00	11.5	=				no	no	na
	NDW06SS21	08/28/03	9.3	J				no	no	na
	NDW06SS08	04/20/00	9.1	J				no	no	na

Table I-2
Detected Chemicals in Surface Soil
SWMU 6, Naval Ammunition Support Detachment
SWMU 6 Former NASD, Vieques Island, Puerto Rico

Chemical	Station ID	Sample Date	Result	Qualifer	Region IX PRG [1]	Ecological Criteria [2]	SSL [3] (DAF=10)	Screening Criteria Exceedances		
								PRG	Ecological	SSL
	NDW06SS04	04/24/00	8.9	J				no	no	na
	NDW06SS01	04/24/00	6	J				no	no	na
	NDW06SS23	08/28/03	5.94	J				no	no	na
	NDW06SS13	08/28/03	5.37	J				no	no	na
	NDW06SS03	04/24/00	4	J				no	no	na
	NDW06SS05	04/24/00	3.3	J				no	no	na
	NDW06SS16	08/28/03	2.87	J				no	no	na
	NDW06SS22	08/28/03	2.52	J				no	no	na
	NDW06SS14	08/28/03	2.42	J				no	no	na
	NDW06SS02	04/24/00	2.4	J				no	no	na
	NDW06SS15	08/28/03	2.35	J				no	no	na
	NDW06SS17	08/28/03	2.25	J				no	no	na
	NDW06SS19	08/28/03	2.11	J				no	no	na
	NDW06SS18	08/28/03	1.88	J				no	no	na
	NDW06SS10	08/28/03	1.71	J				no	no	na
	NDW06SS09	08/28/03	1.59	J				no	no	na
	NDW06SS12	08/28/03	1.55	J				no	no	na
	NDW06SS20	08/28/03	1.3	J				no	no	na
	NDW06SS11	08/28/03	1.02	J				no	no	na
COPPER	NDW06SS13	08/28/03	275	=	313	50	NA	no	yes	na
	NDW06SS05	04/24/00	250	=				no	yes	na
	NDW06SS01	04/24/00	121	=				no	yes	na
	NDW06SS06	04/20/00	114	J				no	yes	na
	NDW06SS08	04/20/00	114	J				no	yes	na
	NDW06SS23	08/28/03	86.7	=				no	yes	na
	NDW06SS07	04/20/00	52.3	J				no	yes	na
	NDW06SS19	08/28/03	41.9	=				no	no	na
	NDW06SS03	04/24/00	38.7	=				no	no	na
	NDW06SS04	04/24/00	36.8	=				no	no	na
	NDW06SS21	08/28/03	29.9	=				no	no	na
	NDW06SS22	08/28/03	20.5	=				no	no	na
	NDW06SS02	04/24/00	16.1	=				no	no	na
	NDW06SS16	08/28/03	15.9	=				no	no	na
	NDW06SS14	08/28/03	14.7	=				no	no	na
	NDW06SS18	08/28/03	13.8	=				no	no	na
	NDW06SS15	08/28/03	13.6	=				no	no	na

Table I-2
Detected Chemicals in Surface Soil
SWMU 6, Naval Ammunition Support Detachment
SWMU 6 Former NASD, Vieques Island, Puerto Rico

Chemical	Station ID	Sample Date	Result	Qualifer	Region IX PRG [1]	Ecological Criteria [2]	SSL [3] (DAF=10)	Screening Criteria Exceedances		
								PRG	Ecological	SSL
	NDW06SS17	08/28/03	12.4	=				no	no	na
	NDW06SS12	08/28/03	12.3	=				no	no	na
	NDW06SS10	08/28/03	9.83	=				no	no	na
	NDW06SS09	08/28/03	9.68	=				no	no	na
	NDW06SS20	08/28/03	7.54	=				no	no	na
	NDW06SS11	08/28/03	5.21	J				no	no	na
IRON	NDW06SS23	08/28/03	93200	=	2350	200	NA	yes	yes	na
	NDW06SS01	04/24/00	80000	=				yes	yes	na
	NDW06SS13	08/28/03	36800	J				yes	yes	na
	NDW06SS06	04/20/00	22900	=				yes	yes	na
	NDW06SS04	04/24/00	20600	=				yes	yes	na
	NDW06SS21	08/28/03	20400	J				yes	yes	na
	NDW06SS08	04/20/00	18500	=				yes	yes	na
	NDW06SS07	04/20/00	16900	=				yes	yes	na
	NDW06SS05	04/24/00	16100	=				yes	yes	na
	NDW06SS03	04/24/00	16000	=				yes	yes	na
	NDW06SS19	08/28/03	9260	J				yes	yes	na
	NDW06SS02	04/24/00	8920	=				yes	yes	na
	NDW06SS16	08/28/03	8780	J				yes	yes	na
	NDW06SS15	08/28/03	7970	J				yes	yes	na
	NDW06SS14	08/28/03	7170	J				yes	yes	na
	NDW06SS17	08/28/03	6820	J				yes	yes	na
	NDW06SS10	08/28/03	6430	J				yes	yes	na
	NDW06SS09	08/28/03	6390	J				yes	yes	na
	NDW06SS18	08/28/03	6290	J				yes	yes	na
	NDW06SS22	08/28/03	5720	J				yes	yes	na
	NDW06SS12	08/28/03	4520	J				yes	yes	na
	NDW06SS20	08/28/03	3230	J				yes	yes	na
	NDW06SS11	08/28/03	2960	=				yes	yes	na
LEAD	NDW06SS01	04/24/00	617	=	400	50	NA	yes	yes	na
	NDW06SS23	08/28/03	397	=				no	yes	na
	NDW06SS13	08/28/03	334	=				no	yes	na
	NDW06SS03	04/24/00	104	=				no	yes	na
	NDW06SS19	08/28/03	87.8	=				no	yes	na
	NDW06SS05	04/24/00	67.5	=				no	yes	na
	NDW06SS06	04/20/00	36.1	=				no	no	na

Table I-2
Detected Chemicals in Surface Soil
SWMU 6, Naval Ammunition Support Detachment
SWMU 6 Former NASD, Vieques Island, Puerto Rico

Chemical	Station ID	Sample Date	Result	Qualifer	Region IX PRG [1]	Ecological Criteria [2]	SSL [3] (DAF=10)	Screening Criteria Exceedances		
								PRG	Ecological	SSL
	NDW06SS08	04/20/00	25.8	=				no	no	na
	NDW06SS04	04/24/00	22.5	=				no	no	na
	NDW06SS02	04/24/00	17.5	=				no	no	na
	NDW06SS09	08/28/03	12.8	=				no	no	na
	NDW06SS18	08/28/03	12.1	=				no	no	na
	NDW06SS12	08/28/03	12	=				no	no	na
	NDW06SS14	08/28/03	10.3	=				no	no	na
	NDW06SS20	08/28/03	7.48	=				no	no	na
	NDW06SS16	08/28/03	6.83	=				no	no	na
	NDW06SS22	08/28/03	6.09	=				no	no	na
	NDW06SS15	08/28/03	5.92	=				no	no	na
	NDW06SS17	08/28/03	5.64	=				no	no	na
	NDW06SS10	08/28/03	4.83	=				no	no	na
	NDW06SS21	08/28/03	4.71	=				no	no	na
	NDW06SS07	04/20/00	3.9	=				no	no	na
	NDW06SS11	08/28/03	3.58	J				no	no	na
MAGNESIUM	NDW06SS06	04/20/00	9050	=	NA	NA	NA	na	na	na
	NDW06SS21	08/28/03	7830	J				na	na	na
	NDW06SS08	04/20/00	7630	=				na	na	na
	NDW06SS04	04/24/00	6870	=				na	na	na
	NDW06SS07	04/20/00	6600	=				na	na	na
	NDW06SS05	04/24/00	5750	=				na	na	na
	NDW06SS01	04/24/00	5180	=				na	na	na
	NDW06SS02	04/24/00	4180	=				na	na	na
	NDW06SS13	08/28/03	3920	J				na	na	na
	NDW06SS03	04/24/00	3800	=				na	na	na
	NDW06SS16	08/28/03	3690	J				na	na	na
	NDW06SS22	08/28/03	3690	J				na	na	na
	NDW06SS15	08/28/03	3470	J				na	na	na
	NDW06SS09	08/28/03	3310	J				na	na	na
	NDW06SS14	08/28/03	3110	J				na	na	na
	NDW06SS17	08/28/03	2870	J				na	na	na
	NDW06SS19	08/28/03	2800	J				na	na	na
	NDW06SS10	08/28/03	2790	J				na	na	na
	NDW06SS18	08/28/03	2730	J				na	na	na
	NDW06SS23	08/28/03	2690	J				na	na	na

Table I-2
Detected Chemicals in Surface Soil
SWMU 6, Naval Ammunition Support Detachment
SWMU 6 Former NASD, Vieques Island, Puerto Rico

Chemical	Station ID	Sample Date	Result	Qualifer	Region IX PRG [1]	Ecological Criteria [2]	SSL [3] (DAF=10)	Screening Criteria Exceedances		
								PRG	Ecological	SSL
	NDW06SS20	08/28/03	2670	J				na	na	na
	NDW06SS12	08/28/03	2270	J				na	na	na
	NDW06SS11	08/28/03	1810	J				na	na	na
MANGANESE	NDW06SS23	08/28/03	741	=	176	100	NA	yes	yes	na
	NDW06SS06	04/20/00	465	J				yes	yes	na
	NDW06SS01	04/24/00	415	=				yes	yes	na
	NDW06SS07	04/20/00	390	J				yes	yes	na
	NDW06SS08	04/20/00	379	J				yes	yes	na
	NDW06SS04	04/24/00	331	=				yes	yes	na
	NDW06SS13	08/28/03	298	=				yes	yes	na
	NDW06SS03	04/24/00	276	=				yes	yes	na
	NDW06SS21	08/28/03	201	=				yes	yes	na
	NDW06SS10	08/28/03	145	=				no	yes	na
	NDW06SS09	08/28/03	138	=				no	yes	na
	NDW06SS05	04/24/00	137	=				no	yes	na
	NDW06SS02	04/24/00	128	=				no	yes	na
	NDW06SS22	08/28/03	81.7	=				no	no	na
	NDW06SS16	08/28/03	58.4	=				no	no	na
	NDW06SS15	08/28/03	57.7	=				no	no	na
	NDW06SS14	08/28/03	53.9	=				no	no	na
	NDW06SS17	08/28/03	49.7	=				no	no	na
	NDW06SS18	08/28/03	49.3	=				no	no	na
	NDW06SS19	08/28/03	49.1	=				no	no	na
	NDW06SS12	08/28/03	43.6	=				no	no	na
	NDW06SS20	08/28/03	40.7	=				no	no	na
	NDW06SS11	08/28/03	30.9	=				no	no	na
MERCURY	NDW06SS01	04/24/00	0.081	J	2.35	0.3	NA	no	no	na
	NDW06SS03	04/24/00	0.081	J				no	no	na
	NDW06SS23	08/28/03	0.0578	=				no	no	na
	NDW06SS13	08/28/03	0.0472	=				no	no	na
	NDW06SS05	04/24/00	0.038	J				no	no	na
	NDW06SS16	08/28/03	0.0235	J				no	no	na
	NDW06SS15	08/28/03	0.0216	J				no	no	na
	NDW06SS18	08/28/03	0.0211	J				no	no	na
	NDW06SS19	08/28/03	0.0194	J				no	no	na
	NDW06SS14	08/28/03	0.0183	J				no	no	na

Table I-2
Detected Chemicals in Surface Soil
SWMU 6, Naval Ammunition Support Detachment
SWMU 6 Former NASD, Vieques Island, Puerto Rico

Chemical	Station ID	Sample Date	Result	Qualifer	Region IX PRG [1]	Ecological Criteria [2]	SSL [3] (DAF=10)	Screening Criteria Exceedances		
								PRG	Ecological	SSL
	NDW06SS12	08/28/03	0.0179	J				no	no	na
	NDW06SS17	08/28/03	0.0159	J				no	no	na
	NDW06SS22	08/28/03	0.0138	J				no	no	na
	NDW06SS09	08/28/03	0.0121	J				no	no	na
	NDW06SS10	08/28/03	0.00908	J				no	no	na
	NDW06SS11	08/28/03	0.00846	J				no	no	na
	NDW06SS20	08/28/03	0.00766	J				no	no	na
	NDW06SS21	08/28/03	0.00337	J				no	no	na
NICKEL	NDW06SS06	04/20/00	20	=	156	30	65	no	no	no
	NDW06SS07	04/20/00	16.5	=				no	no	no
	NDW06SS01	04/24/00	13	=				no	no	no
	NDW06SS23	08/28/03	12.3	J				no	no	no
	NDW06SS08	04/20/00	10.7	=				no	no	no
	NDW06SS21	08/28/03	10.3	J				no	no	no
	NDW06SS13	08/28/03	9.35	J				no	no	no
	NDW06SS04	04/24/00	9.2	J				no	no	no
	NDW06SS03	04/24/00	4.4	J				no	no	no
	NDW06SS05	04/24/00	4	J				no	no	no
	NDW06SS16	08/28/03	3.15	J				no	no	no
	NDW06SS19	08/28/03	2.9	J				no	no	no
	NDW06SS14	08/28/03	2.88	J				no	no	no
	NDW06SS15	08/28/03	2.67	J				no	no	no
	NDW06SS10	08/28/03	2.48	J				no	no	no
	NDW06SS22	08/28/03	2.43	J				no	no	no
	NDW06SS02	04/24/00	2.4	J				no	no	no
	NDW06SS17	08/28/03	2.38	J				no	no	no
	NDW06SS18	08/28/03	2.25	J				no	no	no
	NDW06SS12	08/28/03	2.07	J				no	no	no
	NDW06SS09	08/28/03	1.85	J				no	no	no
	NDW06SS20	08/28/03	1.34	J				no	no	no
	NDW06SS11	08/28/03	1.1	J				no	no	no
POTASSIUM	NDW06SS16	08/28/03	2890	J	NA	NA	NA	na	na	na
	NDW06SS04	04/24/00	2700	J				na	na	na
	NDW06SS21	08/28/03	2700	J				na	na	na
	NDW06SS05	04/24/00	2610	J				na	na	na
	NDW06SS15	08/28/03	2580	J				na	na	na

Table I-2
Detected Chemicals in Surface Soil
SWMU 6, Naval Ammunition Support Detachment
SWMU 6 Former NASD, Vieques Island, Puerto Rico

Chemical	Station ID	Sample Date	Result	Qualifer	Region IX PRG [1]	Ecological Criteria [2]	SSL [3] (DAF=10)	Screening Criteria Exceedances		
								PRG	Ecological	SSL
	NDW06SS08	04/20/00	2440	=				na	na	na
	NDW06SS14	08/28/03	2320	J				na	na	na
	NDW06SS17	08/28/03	2230	J				na	na	na
	NDW06SS18	08/28/03	1970	J				na	na	na
	NDW06SS02	04/24/00	1900	J				na	na	na
	NDW06SS19	08/28/03	1900	J				na	na	na
	NDW06SS03	04/24/00	1820	J				na	na	na
	NDW06SS09	08/28/03	1820	J				na	na	na
	NDW06SS01	04/24/00	1740	J				na	na	na
	NDW06SS12	08/28/03	1720	J				na	na	na
	NDW06SS13	08/28/03	1650	J				na	na	na
	NDW06SS20	08/28/03	1620	J				na	na	na
	NDW06SS07	04/20/00	1570	=				na	na	na
	NDW06SS11	08/28/03	1570	J				na	na	na
	NDW06SS06	04/20/00	1460	=				na	na	na
	NDW06SS22	08/28/03	1450	J				na	na	na
	NDW06SS10	08/28/03	1320	J				na	na	na
	NDW06SS23	08/28/03	1280	J				na	na	na
SELENIUM	NDW06SS14	08/28/03	0.435	J	39.1	1	2.5	no	no	no
	NDW06SS16	08/28/03	0.391	J				no	no	no
SILVER	NDW06SS06	04/20/00	0.41	J	39.1	2	17	no	no	no
	NDW06SS01	04/24/00	0.36	J				no	no	no
	NDW06SS23	08/28/03	0.262	J				no	no	no
	NDW06SS13	08/28/03	0.141	J				no	no	no
	NDW06SS03	04/24/00	0.14	J				no	no	no
	NDW06SS08	04/20/00	0.13	J				no	no	no
	NDW06SS05	04/24/00	0.12	J				no	no	no
	NDW06SS04	04/24/00	0.099	J				no	no	no
	NDW06SS09	08/28/03	0.0346	J				no	no	no
SODIUM	NDW06SS05	04/24/00	14200	=	NA	NA	NA	na	na	na
	NDW06SS02	04/24/00	13700	=				na	na	na
	NDW06SS15	08/28/03	12400	=				na	na	na
	NDW06SS01	04/24/00	12100	=				na	na	na
	NDW06SS16	08/28/03	11800	=				na	na	na
	NDW06SS09	08/28/03	11100	=				na	na	na
	NDW06SS14	08/28/03	10300	=				na	na	na

Table I-2
Detected Chemicals in Surface Soil
SWMU 6, Naval Ammunition Support Detachment
SWMU 6 Former NASD, Vieques Island, Puerto Rico

Chemical	Station ID	Sample Date	Result	Qualifer	Region IX PRG [1]	Ecological Criteria [2]	SSL [3] (DAF=10)	Screening Criteria Exceedances		
								PRG	Ecological	SSL
	NDW06SS19	08/28/03	9880	=				na	na	na
	NDW06SS18	08/28/03	9450	=				na	na	na
	NDW06SS17	08/28/03	9400	=				na	na	na
	NDW06SS22	08/28/03	7750	=				na	na	na
	NDW06SS20	08/28/03	7730	=				na	na	na
	NDW06SS12	08/28/03	7240	=				na	na	na
	NDW06SS11	08/28/03	7150	=				na	na	na
	NDW06SS03	04/24/00	6300	=				na	na	na
	NDW06SS21	08/28/03	5460	=				na	na	na
	NDW06SS04	04/24/00	5390	=				na	na	na
	NDW06SS10	08/28/03	5140	=				na	na	na
	NDW06SS07	04/20/00	4700	=				na	na	na
	NDW06SS13	08/28/03	4500	=				na	na	na
	NDW06SS23	08/28/03	4080	=				na	na	na
	NDW06SS08	04/20/00	4040	=				na	na	na
	NDW06SS06	04/20/00	3250	=				na	na	na
THALLIUM	NDW06SS01	04/24/00	4.3	=	0.516	1	NA	yes	yes	na
	NDW06SS05	04/24/00	0.82	J				yes	no	na
	NDW06SS04	04/24/00	0.77	J				yes	no	na
VANADIUM	NDW06SS21	08/28/03	71.4	=	54.7	2	3000	yes	yes	no
	NDW06SS06	04/20/00	66	=				yes	yes	no
	NDW06SS04	04/24/00	65.8	=				yes	yes	no
	NDW06SS07	04/20/00	51.2	=				no	yes	no
	NDW06SS08	04/20/00	51	=				no	yes	no
	NDW06SS13	08/28/03	29.8	=				no	yes	no
	NDW06SS03	04/24/00	27.7	=				no	yes	no
	NDW06SS05	04/24/00	26.5	=				no	yes	no
	NDW06SS16	08/28/03	23.5	=				no	yes	no
	NDW06SS01	04/24/00	23.2	=				no	yes	no
	NDW06SS15	08/28/03	20.1	=				no	yes	no
	NDW06SS02	04/24/00	19.9	=				no	yes	no
	NDW06SS23	08/28/03	19.7	=				no	yes	no
	NDW06SS14	08/28/03	19.5	=				no	yes	no
	NDW06SS17	08/28/03	19.3	=				no	yes	no
	NDW06SS22	08/28/03	18.7	=				no	yes	no
	NDW06SS19	08/28/03	18	=				no	yes	no

Table I-2
Detected Chemicals in Surface Soil
SWMU 6, Naval Ammunition Support Detachment
SWMU 6 Former NASD, Vieques Island, Puerto Rico

Chemical	Station ID	Sample Date	Result	Qualifer	Region IX PRG [1]	Ecological Criteria [2]	SSL [3] (DAF=10)	Screening Criteria Exceedances		
								PRG	Ecological	SSL
	NDW06SS09	08/28/03	14.6	=				no	yes	no
	NDW06SS18	08/28/03	14.5	=				no	yes	no
	NDW06SS10	08/28/03	14	=				no	yes	no
	NDW06SS12	08/28/03	13.4	=				no	yes	no
	NDW06SS20	08/28/03	10.5	J				no	yes	no
	NDW06SS11	08/28/03	9.84	J				no	yes	no
ZINC	NDW06SS01	04/24/00	438	=	2350	50	6000	no	yes	no
	NDW06SS23	08/28/03	389	=				no	yes	no
	NDW06SS13	08/28/03	357	=				no	yes	no
	NDW06SS05	04/24/00	138	=				no	yes	no
	NDW06SS09	08/28/03	127	=				no	yes	no
	NDW06SS19	08/28/03	99.1	=				no	yes	no
	NDW06SS06	04/20/00	96.5	=				no	yes	no
	NDW06SS04	04/24/00	86.3	=				no	yes	no
	NDW06SS08	04/20/00	83.7	=				no	yes	no
	NDW06SS03	04/24/00	82.2	=				no	yes	no
	NDW06SS02	04/24/00	42	=				no	no	no
	NDW06SS12	08/28/03	37.7	=				no	no	no
	NDW06SS18	08/28/03	34.4	=				no	no	no
	NDW06SS21	08/28/03	34.4	=				no	no	no
	NDW06SS07	04/20/00	29.5	=				no	no	no
	NDW06SS14	08/28/03	29.1	=				no	no	no
	NDW06SS16	08/28/03	28.9	=				no	no	no
	NDW06SS22	08/28/03	27.3	=				no	no	no
	NDW06SS15	08/28/03	25.1	=				no	no	no
	NDW06SS17	08/28/03	22.1	=				no	no	no
	NDW06SS20	08/28/03	18.1	=				no	no	no
	NDW06SS10	08/28/03	12.9	J				no	no	no
	NDW06SS11	08/28/03	12.6	=				no	no	no
Volatile Organic Compounds (mg/Kg)										
ACETONE	NDW06SS14	08/28/03	1.33	J	157	NA	8	no	na	no
CARBON DISULFIDE	NDW06SS01	04/24/00	0.002	J	35.5	NA	16	no	na	no
	NDW06SS02	04/24/00	0.002	J				no	na	no
	NDW06SS18	08/28/03	0.0015	J				no	na	no
	NDW06SS15	08/28/03	0.0013	J				no	na	no
	NDW06SS05	04/24/00	0.0007	J				no	na	no

Table I-2
Detected Chemicals in Surface Soil
SWMU 6, Naval Ammunition Support Detachment
SWMU 6 Former NASD, Vieques Island, Puerto Rico

Chemical	Station ID	Sample Date	Result	Qualifer	Region IX PRG [1]	Ecological Criteria [2]	SSL [3] (DAF=10)	Screening Criteria Exceedances		
								PRG	Ecological	SSL
ETHYLBENZENE	NDW06SS08	04/20/00	0.001	J	8.92	0.05	6.5	no	no	no
M,P-XYLENE (SUM OF ISOMERS)	NDW06SS08	04/20/00	0.004	J	27.5	NA	105	no	na	no
	NDW06SS01	04/24/00	0.0007	J				no	na	no
METHYL ETHYL KETONE (2-BUTANONE)	NDW06SS01	04/24/00	0.003	J	733	NA	NA	no	na	na
METHYLENE CHLORIDE	NDW06SS16	08/28/03	0.0015	J	9.11	NA	0.01	no	na	no
	NDW06SS14	08/28/03	0.0014	J				no	na	no
	NDW06SS23	08/28/03	0.00065	J				no	na	no
O-XYLENE (1,2-DIMETHYLBENZENE)	NDW06SS08	04/20/00	0.002	J	27.5	NA	105	no	na	no
TOLUENE	NDW06SS08	04/20/00	0.0008	J	520	200	6	no	no	no
XYLENES, TOTAL	NDW06SS08	04/20/00	0.006	J	27.5	0.05	105	no	no	no
	NDW06SS01	04/24/00	0.0007	J				no	no	no

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SWMU 6, Naval Ammunition Support Detachment
SWMU 6 Former NASD, Vieques Island, Puerto Rico

Chemical	Station ID	Sample Date	Result	Qualifer	Region IX PRG [1]	Ecological Criteria [2]	SSL [3] (DAF=10)	Screening Criteria Exceedances		
								PRG	Ecological	SSL
Semivolatile Organic Compounds (mg/Kg)										
2-METHYLNAPHTHALENE	NDW06SS05	04/24/00	0.311	J	160	NA	NA	no	na	na
ACENAPHTHENE	NDW06SS05	04/24/00	0.684	=	368	20	285	no	no	no
ACENAPHTHYLENE	NDW06SS13	08/28/03	0.0282	J	NA	NA	NA	na	na	na
ANTHRACENE	NDW06SS05	04/24/00	0.902	=	2190	0.1	6000	no	yes	no
	NDW06SS13	08/28/03	0.0845	J				no	no	no
BENZO(a)ANTHRACENE	NDW06SS05	04/24/00	1.87	=	0.621	NA	1	yes	na	yes
	NDW06SS13	08/28/03	0.348	J				no	na	no
	NDW06SS12	08/28/03	0.184	J				no	na	no
	NDW06SS18	08/28/03	0.0922	J				no	na	no
	NDW06SS08	04/20/00	0.041	J				no	na	no
BENZO(a)PYRENE	NDW06SS05	04/24/00	1.51	=	0.0621	0.1	4	yes	yes	no
	NDW06SS13	08/28/03	0.925	=				yes	yes	no
	NDW06SS12	08/28/03	0.22	J				yes	yes	no
	NDW06SS18	08/28/03	0.136	J				yes	yes	no
	NDW06SS08	04/20/00	0.081	J				yes	no	no
	NDW06SS06	04/20/00	0.052	J				no	no	no
	NDW06SS23	08/28/03	0.0417	J				no	no	no
BENZO(b)FLUORANTHENE	NDW06SS05	04/24/00	1.8	=	0.621	NA	2.5	yes	na	no
	NDW06SS13	08/28/03	0.595	=				no	na	no
	NDW06SS12	08/28/03	0.268	J				no	na	no
	NDW06SS18	08/28/03	0.172	J				no	na	no
	NDW06SS08	04/20/00	0.121	J				no	na	no
	NDW06SS06	04/20/00	0.068	J				no	na	no
	NDW06SS23	08/28/03	0.0551	J				no	na	no
	NDW06SS19	08/28/03	0.0287	J				no	na	no
BENZO(g,h,i)PERYLENE	NDW06SS13	08/28/03	1.16	=	2300	1	NA	no	yes	na
	NDW06SS05	04/24/00	0.432	J				no	no	na
	NDW06SS12	08/28/03	0.153	J				no	no	na
	NDW06SS18	08/28/03	0.076	J				no	no	na
	NDW06SS08	04/20/00	0.056	J				no	no	na
	NDW06SS23	08/28/03	0.0542	J				no	no	na
	NDW06SS06	04/20/00	0.04	J				no	no	na
BENZO(k)FLUORANTHENE	NDW06SS05	04/24/00	1.23	=	6.21	NA	24.5	no	na	no
	NDW06SS13	08/28/03	0.509	=				no	na	no
	NDW06SS12	08/28/03	0.205	J				no	na	no

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Detected Chemicals in Surface Soil
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Chemical	Station ID	Sample Date	Result	Qualifer	Region IX PRG [1]	Ecological Criteria [2]	SSL [3] (DAF=10)	Screening Criteria Exceedances		
								PRG	Ecological	SSL
	NDW06SS18	08/28/03	0.173	J				no	na	no
	NDW06SS08	04/20/00	0.088	J				no	na	no
	NDW06SS06	04/20/00	0.059	J				no	na	no
	NDW06SS23	08/28/03	0.0417	J				no	na	no
bis(2-ETHYLHEXYL) PHTHALATE	NDW06SS01	04/24/00	1.4	=	34.7	NA	NA	no	na	na
	NDW06SS06	04/20/00	0.135	J				no	na	na
CARBAZOLE	NDW06SS05	04/24/00	0.431	J	24.3	NA	0.3	no	na	yes
CHRYSENE	NDW06SS05	04/24/00	2	=	62.1	NA	80	no	na	no
	NDW06SS13	08/28/03	0.442	=				no	na	no
	NDW06SS18	08/28/03	0.27	J				no	na	no
	NDW06SS12	08/28/03	0.254	J				no	na	no
	NDW06SS08	04/20/00	0.118	J				no	na	no
	NDW06SS06	04/20/00	0.052	J				no	na	no
	NDW06SS23	08/28/03	0.0359	J				no	na	no
	NDW06SS19	08/28/03	0.0358	J				no	na	no
DIBENZ(a,h)ANTHRACENE	NDW06SS13	08/28/03	0.345	J	0.0621	NA	1	yes	na	no
	NDW06SS05	04/24/00	0.254	J				yes	na	no
	NDW06SS12	08/28/03	0.0517	J				no	na	no
DIBENZOFURAN	NDW06SS05	04/24/00	0.784	=	29.1	NA	NA	no	na	na
FLUORANTHENE	NDW06SS05	04/24/00	4.06	=	229	0.1	2150	no	yes	no
	NDW06SS18	08/28/03	0.445	J				no	yes	no
	NDW06SS13	08/28/03	0.3	J				no	yes	no
	NDW06SS12	08/28/03	0.268	J				no	yes	no
	NDW06SS08	04/20/00	0.05	J				no	no	no
	NDW06SS19	08/28/03	0.0412	J				no	no	no
	NDW06SS23	08/28/03	0.0322	J				no	no	no
FLUORENE	NDW06SS05	04/24/00	0.44	J	275	30	280	no	no	no
INDENO(1,2,3-c,d)PYRENE	NDW06SS13	08/28/03	1.13	=	0.621	NA	7	yes	na	no
	NDW06SS05	04/24/00	0.653	=				yes	na	no
	NDW06SS12	08/28/03	0.204	J				no	na	no
	NDW06SS18	08/28/03	0.13	J				no	na	no
	NDW06SS08	04/20/00	0.074	J				no	na	no
	NDW06SS06	04/20/00	0.05	J				no	na	no
NAPHTHALENE	NDW06SS05	04/24/00	0.621	=	5.59	0.1	42	no	yes	no
PHENANTHRENE	NDW06SS05	04/24/00	4.86	=	NA	0.1	NA	na	yes	na
	NDW06SS13	08/28/03	0.272	J				na	yes	na

Table I-2
Detected Chemicals in Surface Soil
SWMU 6, Naval Ammunition Support Detachment
SWMU 6 Former NASD, Vieques Island, Puerto Rico

Chemical	Station ID	Sample Date	Result	Qualifer	Region IX PRG [1]	Ecological Criteria [2]	SSL [3] (DAF=10)	Screening Criteria Exceedances		
								PRG	Ecological	SSL
	NDW06SS23	08/28/03	0.0311	J				na	no	na
	NDW06SS12	08/28/03	0.0276	J				na	no	na
PYRENE	NDW06SS05	04/24/00	2.9	=	232	0.1	2100	no	yes	no
	NDW06SS13	08/28/03	0.603	=				no	yes	no
	NDW06SS18	08/28/03	0.372	J				no	yes	no
	NDW06SS12	08/28/03	0.258	J				no	yes	no
	NDW06SS08	04/20/00	0.051	J				no	no	no
	NDW06SS23	08/28/03	0.0476	J				no	no	no
	NDW06SS19	08/28/03	0.0409	J				no	no	no
	NDW06SS01	04/24/00	0.037	J				no	no	no
	NDW06SS06	04/20/00	0.033	J				no	no	no
Pesticides (mg/Kg)										
ALPHA-CHLORDANE	NDW06SS06	04/20/00	0.00061	J	1.62	NA	5	no	na	no
ENDRIN ALDEHYDE	NDW06SS19	08/28/03	0.011	J	1.8	0.1	NA	no	no	na
p,p'-DDD	NDW06SS13	08/28/03	0.028	J	2.44	0.0025	8	no	yes	no
	NDW06SS08	04/20/00	0.013	J				no	yes	no
	NDW06SS01	04/24/00	0.011	J				no	yes	no
	NDW06SS23	08/28/03	0.0042	J				no	yes	no
	NDW06SS15	08/28/03	0.0025	J				no	no	no
	NDW06SS05	04/24/00	0.002	J				no	no	no
	NDW06SS04	04/24/00	0.00062	J				no	no	no
p,p'-DDE	NDW06SS06	04/20/00	0.074	J	1.72	0.0025	27	no	yes	no
	NDW06SS08	04/20/00	0.046	J				no	yes	no
	NDW06SS01	04/24/00	0.029	J				no	yes	no
	NDW06SS13	08/28/03	0.023	J				no	yes	no
	NDW06SS23	08/28/03	0.018	J				no	yes	no
	NDW06SS05	04/24/00	0.0075	J				no	yes	no
	NDW06SS03	04/24/00	0.0067	J				no	yes	no
	NDW06SS02	04/24/00	0.0038	J				no	yes	no
	NDW06SS12	08/28/03	0.0028	J				no	yes	no
	NDW06SS07	04/20/00	0.0018	J				no	no	no
	NDW06SS04	04/24/00	0.0012	J				no	no	no
	NDW06SS22	08/28/03	0.00037	J				no	no	no
p,p'-DDT	NDW06SS06	04/20/00	0.017	J	1.72	0.0025	16	no	yes	no
	NDW06SS13	08/28/03	0.0092	J				no	yes	no
	NDW06SS01	04/24/00	0.0072	J				no	yes	no

Table I-2
Detected Chemicals in Surface Soil
SWMU 6, Naval Ammunition Support Detachment
SWMU 6 Former NASD, Vieques Island, Puerto Rico

Chemical	Station ID	Sample Date	Result	Qualifer	Region IX PRG [1]	Ecological Criteria [2]	SSL [3] (DAF=10)	Screening Criteria Exceedances		
								PRG	Ecological	SSL
	NDW06SS08	04/20/00	0.007	J				no	yes	no
	NDW06SS03	04/24/00	0.003	J				no	yes	no
Polychlorinated Biphenyls (mg/Kg)										
PCB-1254 (AROCHLOR 1254)	NDW06SS23	08/28/03	0.043	J	0.222	40	NA	no	no	na

[1] USEPA Region IX PRG (2002) based on a hazard index (HI) of 0.1 for non-carcinogens.

[2] The lower of the toxicological benchmarks terrestrial plants, (Efroymson, 1997a) or invertebrates and heterotrophs (Efroymson, 1997b).

[3] USEPA Region IX PRG soil screening level (SSL, 2002) based on a dilution attenuation factof (DAF) of 10.

ND indicates that the chemical was not detected.

NA indicates that the information is not available or not applicable.

J indicates that the chemical was detected. The reported value is estimated.

= infdicates that the chemical was detected. The reported value is the measured concentration.

Table I-2
Detected Chemicals in Suburface Soil
SWMU 6, Naval Ammunition Support Detachment
SWMU 6 Former NASD, Vieques Island, Puerto Rico

Chemical	Station ID	Sample Date	Result	Qualifer	SSL [1] (DAF=10)	Exceedances of SSL
		Metals (mg/Kg)				
ALUMINUM	NDW06SB06	04/20/00	12500	=	NA	na
	NDW06SB04	04/24/00	10300	=		na
	NDW06SB01	04/24/00	9320	=		na
	NDW06SB08	04/20/00	7190	=		na
	NDW06SB07	04/20/00	6470	=		na
	NDW06SB02	04/24/00	5860	=		na
	NDW06SB03	04/24/00	5440	=		na
	NDW06SB05	04/24/00	5190	=		na
ANTIMONY	NDW06SB01	04/24/00	4.1	J	2.5	yes
	NDW06SB03	04/24/00	0.93	J		no
	NDW06SB02	04/24/00	0.61	J		no
	NDW06SB04	04/24/00	0.53	J		no
	NDW06SB06	04/20/00	0.46	J		no
ARSENIC	NDW06SB01	04/24/00	2.2	J	14.5	no
	NDW06SB03	04/24/00	2	J		no
	NDW06SB05	04/24/00	1.2	J		no
	NDW06SB07	04/20/00	1.1	J		no
	NDW06SB08	04/20/00	1.1	J		no
	NDW06SB04	04/24/00	1	J		no
	NDW06SB06	04/20/00	0.88	J		no
	NDW06SB02	04/24/00	0.76	J		no
BARIUM	NDW06SB06	04/20/00	36.9	J	800	no
	NDW06SB03	04/24/00	27.9	J		no
	NDW06SB08	04/20/00	24.3	J		no
	NDW06SB07	04/20/00	24	J		no
	NDW06SB01	04/24/00	20.4	J		no
	NDW06SB04	04/24/00	19.3	J		no
	NDW06SB02	04/24/00	12.9	J		no
	NDW06SB05	04/24/00	12.6	J		no

Table I-2
Detected Chemicals in Suburface Soil
SWMU 6, Naval Ammunition Support Detachment
SWMU 6 Former NASD, Vieques Island, Puerto Rico

Chemical	Station ID	Sample Date	Result	Qualifer	SSL [1] (DAF=10)	Exceedances of SSL
BERYLLIUM	NDW06SB04	04/24/00	0.14	J	31.5	no
	NDW06SB06	04/20/00	0.092	J		no
	NDW06SB08	04/20/00	0.072	J		no
	NDW06SB07	04/20/00	0.066	J		no
	NDW06SB03	04/24/00	0.055	J		no
	NDW06SB01	04/24/00	0.048	J		no
CADMIUM	NDW06SB05	04/24/00	0.63	J	4	no
	NDW06SB04	04/24/00	0.48	J		no
	NDW06SB01	04/24/00	0.44	J		no
	NDW06SB02	04/24/00	0.33	J		no
	NDW06SB06	04/20/00	0.29	J		no
	NDW06SB07	04/20/00	0.16	J		no
	NDW06SB08	04/20/00	0.14	J		no
CALCIUM	NDW06SB02	04/24/00	138000	J	NA	na
	NDW06SB05	04/24/00	122000	J		na
	NDW06SB07	04/20/00	114000	J		na
	NDW06SB08	04/20/00	104000	J		na
	NDW06SB06	04/20/00	102000	J		na
	NDW06SB03	04/24/00	97600	J		na
	NDW06SB01	04/24/00	96500	J		na
	NDW06SB04	04/24/00	42600	J		na
CHROMIUM, TOTAL	NDW06SB06	04/20/00	25.4	=	19	yes
	NDW06SB04	04/24/00	17.8	=		no
	NDW06SB01	04/24/00	11.6	=		no
	NDW06SB03	04/24/00	9.7	=		no
	NDW06SB08	04/20/00	6.7	=		no
	NDW06SB07	04/20/00	6.3	=		no
	NDW06SB05	04/24/00	5.9	=		no
	NDW06SB02	04/24/00	5.7	=		no
COBALT	NDW06SB04	04/24/00	9.4	J	NA	na

Table I-2
Detected Chemicals in Suburface Soil
SWMU 6, Naval Ammunition Support Detachment
SWMU 6 Former NASD, Vieques Island, Puerto Rico

Chemical	Station ID	Sample Date	Result	Qualifer	SSL [1] (DAF=10)	Exceedances of SSL
	NDW06SB06	04/20/00	8.2	J		na
	NDW06SB03	04/24/00	4.2	J		na
	NDW06SB01	04/24/00	3.5	J		na
	NDW06SB07	04/20/00	2.2	J		na
	NDW06SB08	04/20/00	2.2	J		na
	NDW06SB02	04/24/00	2.1	J		na
	NDW06SB05	04/24/00	1.9	J		na
COPPER	NDW06SB06	04/20/00	137	J	NA	na
	NDW06SB01	04/24/00	51.5	=		na
	NDW06SB04	04/24/00	38.2	=		na
	NDW06SB07	04/20/00	37.1	J		na
	NDW06SB03	04/24/00	35.7	=		na
	NDW06SB05	04/24/00	34.4	=		na
	NDW06SB02	04/24/00	15	=		na
	NDW06SB08	04/20/00	10	J		na
IRON	NDW06SB04	04/24/00	25100	=	NA	na
	NDW06SB01	04/24/00	21900	=		na
	NDW06SB03	04/24/00	17900	=		na
	NDW06SB06	04/20/00	15400	=		na
	NDW06SB08	04/20/00	8230	=		na
	NDW06SB07	04/20/00	7980	=		na
	NDW06SB02	04/24/00	7330	=		na
	NDW06SB05	04/24/00	5910	=		na
LEAD	NDW06SB01	04/24/00	332	=	NA	na
	NDW06SB03	04/24/00	97.8	=		na
	NDW06SB02	04/24/00	25.8	=		na
	NDW06SB04	04/24/00	16.9	=		na
	NDW06SB06	04/20/00	16.1	=		na
	NDW06SB05	04/24/00	8.8	=		na
	NDW06SB08	04/20/00	2.8	=		na

Table I-2
Detected Chemicals in Suburface Soil
SWMU 6, Naval Ammunition Support Detachment
SWMU 6 Former NASD, Vieques Island, Puerto Rico

Chemical	Station ID	Sample Date	Result	Qualifer	SSL [1] (DAF=10)	Exceedances of SSL
	NDW06SB07	04/20/00	2.3	=		na
MAGNESIUM	NDW06SB04	04/24/00	8130	=	NA	na
	NDW06SB01	04/24/00	5580	=		na
	NDW06SB06	04/20/00	5220	=		na
	NDW06SB02	04/24/00	3810	=		na
	NDW06SB08	04/20/00	3490	=		na
	NDW06SB03	04/24/00	3130	=		na
	NDW06SB07	04/20/00	3130	=		na
	NDW06SB05	04/24/00	2920	=		na
MANGANESE	NDW06SB06	04/20/00	343	J	NA	na
	NDW06SB04	04/24/00	295	=		na
	NDW06SB01	04/24/00	227	=		na
	NDW06SB03	04/24/00	219	=		na
	NDW06SB07	04/20/00	213	J		na
	NDW06SB08	04/20/00	170	J		na
	NDW06SB02	04/24/00	117	=		na
	NDW06SB05	04/24/00	72	=		na
MERCURY	NDW06SB03	04/24/00	0.072	J	NA	na
	NDW06SB01	04/24/00	0.053	J		na
	NDW06SB02	04/24/00	0.042	J		na
	NDW06SB06	04/20/00	0.018	J		na
NICKEL	NDW06SB06	04/20/00	12.4	=	65	no
	NDW06SB04	04/24/00	9.7	J		no
	NDW06SB01	04/24/00	5.1	J		no
	NDW06SB03	04/24/00	4.5	J		no
	NDW06SB02	04/24/00	2.3	J		no
	NDW06SB05	04/24/00	1.8	J		no
	NDW06SB08	04/20/00	1.8	J		no
	NDW06SB07	04/20/00	1.4	J		no
POTASSIUM	NDW06SB02	04/24/00	2670	J	NA	na

Table I-2
Detected Chemicals in Suburface Soil
SWMU 6, Naval Ammunition Support Detachment
SWMU 6 Former NASD, Vieques Island, Puerto Rico

Chemical	Station ID	Sample Date	Result	Qualifer	SSL [1] (DAF=10)	Exceedances of SSL
	NDW06SB01	04/24/00	2630	J		na
	NDW06SB04	04/24/00	2510	J		na
	NDW06SB08	04/20/00	2490	=		na
	NDW06SB07	04/20/00	2220	=		na
	NDW06SB06	04/20/00	1840	=		na
	NDW06SB03	04/24/00	1810	J		na
	NDW06SB05	04/24/00	1590	J		na
SELENIUM	NDW06SB08	04/20/00	0.29	J	2.5	no
SILVER	NDW06SB03	04/24/00	0.27	J	17	no
	NDW06SB06	04/20/00	0.19	J		no
	NDW06SB01	04/24/00	0.11	J		no
SODIUM	NDW06SB01	04/24/00	16500	=	NA	na
	NDW06SB02	04/24/00	15400	=		na
	NDW06SB05	04/24/00	8370	=		na
	NDW06SB08	04/20/00	6230	=		na
	NDW06SB03	04/24/00	6120	=		na
	NDW06SB07	04/20/00	5710	=		na
	NDW06SB06	04/20/00	4790	=		na
	NDW06SB04	04/24/00	4200	=		na
THALLIUM	NDW06SB01	04/24/00	1.5	J	NA	na
	NDW06SB04	04/24/00	1.5	J		na
	NDW06SB03	04/24/00	1.3	J		na
VANADIUM	NDW06SB04	04/24/00	80.2	=	3000	no
	NDW06SB06	04/20/00	37.1	=		no
	NDW06SB01	04/24/00	27.9	=		no
	NDW06SB03	04/24/00	27.3	=		no
	NDW06SB08	04/20/00	21.1	=		no
	NDW06SB02	04/24/00	20.7	=		no
	NDW06SB07	04/20/00	20.1	=		no
	NDW06SB05	04/24/00	19.4	=		no

Table I-2
Detected Chemicals in Suburface Soil
SWMU 6, Naval Ammunition Support Detachment
SWMU 6 Former NASD, Vieques Island, Puerto Rico

Chemical	Station ID	Sample Date	Result	Qualifer	SSL [1] (DAF=10)	Exceedances of SSL
ZINC	NDW06SB01	04/24/00	216	=	6000	no
	NDW06SB06	04/20/00	200	=		no
	NDW06SB03	04/24/00	68.1	=		no
	NDW06SB04	04/24/00	58.1	=		no
	NDW06SB02	04/24/00	37.5	=		no
	NDW06SB05	04/24/00	23.5	=		no
	NDW06SB08	04/20/00	14.9	=		no
	NDW06SB07	04/20/00	14.5	=		no
Volatile Organic Compounds (mg/Kg)						
BENZENE	NDW06SB02	04/24/00	0.0002	J	0.015	no
	NDW06SB05	04/24/00	0.0002	J		no
CARBON DISULFIDE	NDW06SB07	04/20/00	0.006	J	16	no
	NDW06SB08	04/20/00	0.006	J		no
	NDW06SB02	04/24/00	0.004	J		no
	NDW06SB01	04/24/00	0.002	J		no
	NDW06SB03	04/24/00	0.002	J		no
	NDW06SB05	04/24/00	0.001	J		no
ETHYLBENZENE	NDW06SB02	04/24/00	0.001	J	6.5	no
M,P-XYLENE (SUM OF ISOMERS)	NDW06SB01	04/24/00	0.0006	J	105	no
METHYL ETHYL KETONE (2-BUTANONI	NDW06SB01	04/24/00	0.003	J	NA	na
O-XYLENE (1,2-DIMETHYLBENZENE)	NDW06SB02	04/24/00	0.002	J	105	no
TETRACHLOROETHYLENE(PCE)	NDW06SB02	04/24/00	0.002	J	0.03	no
TOLUENE	NDW06SB02	04/24/00	0.0009	J	6	no
XYLENES, TOTAL	NDW06SB01	04/24/00	0.0006	J	105	no
Semivolatile Organic Compounds (mg/Kg)						
BENZO(a)ANTHRACENE	NDW06SB01	04/24/00	0.1	J	1	no
BENZO(a)PYRENE	NDW06SB01	04/24/00	0.123	J	4	no
	NDW06SB06	04/20/00	0.059	J		no
BENZO(b)FLUORANTHENE	NDW06SB06	04/20/00	0.087	J	2.5	no
	NDW06SB01	04/24/00	0.081	J		no

Table I-2
Detected Chemicals in Suburface Soil
SWMU 6, Naval Ammunition Support Detachment
SWMU 6 Former NASD, Vieques Island, Puerto Rico

Chemical	Station ID	Sample Date	Result	Qualifer	SSL [1] (DAF=10)	Exceedances of SSL
BENZO(g,h,i)PERYLENE	NDW06SB01	04/24/00	0.069	J	NA	na
	NDW06SB06	04/20/00	0.054	J		na
BENZO(k)FLUORANTHENE	NDW06SB01	04/24/00	0.075	J	24.5	no
	NDW06SB06	04/20/00	0.052	J		no
bis(2-ETHYLHEXYL) PHTHALATE	NDW06SB03	04/24/00	0.135	J	NA	na
CHRYSENE	NDW06SB01	04/24/00	0.122	J	80	no
	NDW06SB06	04/20/00	0.045	J		no
FLUORANTHENE	NDW06SB01	04/24/00	0.125	J	2150	no
	NDW06SB05	04/24/00	0.043	J		no
INDENO(1,2,3-c,d)PYRENE	NDW06SB01	04/24/00	0.07	J	7	no
	NDW06SB06	04/20/00	0.062	J		no
PHENANTHRENE	NDW06SB01	04/24/00	0.085	J	NA	na
PYRENE	NDW06SB01	04/24/00	0.195	J	2100	no
	NDW06SB05	04/24/00	0.031	J		no

Table I-2
Detected Chemicals in Suburface Soil
SWMU 6, Naval Ammunition Support Detachment
SWMU 6 Former NASD, Vieques Island, Puerto Rico

Chemical	Station ID	Sample Date	Result	Qualifer	SSL [1] (DAF=10)	Exceedances of SSL
		Pesticides (mg/Kg)				
p,p'-DDD	NDW06SB01	04/24/00	0.013	J	8	no
	NDW06SB06	04/20/00	0.012	J		no
	NDW06SB03	04/24/00	0.001	J		no
	NDW06SB02	04/24/00	0.00084	J		no
	NDW06SB05	04/24/00	0.00032	J		no
p,p'-DDE	NDW06SB06	04/20/00	0.316	J	27	no
	NDW06SB01	04/24/00	0.03	J		no
	NDW06SB02	04/24/00	0.011	J		no
	NDW06SB03	04/24/00	0.0058	J		no
	NDW06SB05	04/24/00	0.002	J		no
	NDW06SB04	04/24/00	0.00088	J		no
p,p'-DDT	NDW06SB06	04/20/00	0.019	J	16	no
	NDW06SB03	04/24/00	0.0018	J		no

[1] USEPA Region IX PRG soil screening level (SSL, 2002) based on a dilution attenuation factof (DAF) of 10.
ND indicates that the chemical was not detected.
NA indicates that the information is not available or not applicable.
J indicates that the chemical was detected. The reported value is estimated.
= infdicates that the chemical was detected. The reported value is the measured concentration.

Table I-2
Detected Chemicals in Groundwater
SWMU 6, Naval Ammunition Support Detachment
SWMU 6 Former NASD, Vieques Island, Puerto Rico

Chemical	Station ID	Sample Date	Concentration				Region IX PRG [1]	PRG Exceedances	
			Total	Qualifer	Dissolved	Qualifer		Total	Dissolved
Metals (ug/L)									
ALUMINUM	NDW06MW02	05/02/00	1460	=	ND		3650	no	no
	NDW06MW01	05/02/00	306	=	ND			no	no
	NDW06MW03	05/02/00	182	J	ND			no	no
	NDW06MW04	05/02/00	164	J	ND			no	no
ANTIMONY	NDW06MW03	09/05/03	104	J	ND		1.46	yes	no
	NDW06MW05	09/05/03	73.3	J	ND			yes	no
	NDW06MW02	09/05/03	51.8	J	ND			yes	no
	NDW06MW06	09/05/03	35.5	J	ND			yes	no
	NDW06MW02	05/02/00	3.7	J	ND			yes	no
	NDW06MW03	05/02/00	ND		1.8	J		no	yes
ARSENIC	NDW06MW05	09/05/03	152	J	ND		0.0448	yes	no
	NDW06MW06	09/05/03	120	=	30.3	J		yes	yes
	NDW06MW02	09/05/03	51.7	J	25.2	J		yes	yes
	NDW06MW01	09/05/03	30.4	J	23.6	J		yes	yes
	NDW06MW04	05/02/00	10	=	13.3	=		yes	yes
	NDW06MW01	05/02/00	6.8	J	7.3	J		yes	yes
	NDW06MW03	05/02/00	6.5	J	5.9	J		yes	yes
	NDW06MW02	05/02/00	3.5	J	4.8	J		yes	yes
	NDW06MW03	09/05/03	ND		21.7	J		no	yes
BARIUM	NDW06MW02	09/05/03	728	J	780	J	255	yes	yes
	NDW06MW01	05/02/00	519	=	481	=		yes	yes
	NDW06MW04	05/02/00	425	=	381	=		yes	yes
	NDW06MW02	05/02/00	283	=	294	=		yes	yes
	NDW06MW03	05/02/00	194	J	179	J		no	no
	NDW06MW04	09/07/03	166	J	145	J		no	no
	NDW06MW01	09/05/03	158	J	164	J		no	no
	NDW06MW05	09/05/03	155	J	156	J		no	no
	NDW06MW06	09/05/03	147	J	157	J		no	no
	NDW06MW03	09/05/03	122	J	135	J		no	no
BERYLLIUM	NDW06MW02	05/02/00	0.44	J	ND		7.3	no	no
	NDW06MW03	05/02/00	0.42	J	ND			no	no
	NDW06MW04	05/02/00	0.33	J	ND			no	no
	NDW06MW01	05/02/00	0.32	J	ND			no	
	NDW06MW04	09/07/03	ND		5.53	J			no
CADMIUM	NDW06MW05	09/05/03	14.2	J	ND		1.82	yes	

Table I-2
Detected Chemicals in Groundwater
SWMU 6, Naval Ammunition Support Detachment
SWMU 6 Former NASD, Vieques Island, Puerto Rico

Chemical	Station ID	Sample Date	Concentration				Region IX PRG [1]	PRG Exceedances	
			Total	Qualifer	Dissolved	Qualifer		Total	Dissolved
	NDW06MW06	09/05/03	6.77	J	ND			yes	
	NDW06MW01	05/02/00	3.3	J	2.9	J		yes	yes
	NDW06MW03	05/02/00	2.8	J	2	J		yes	yes
	NDW06MW04	05/02/00	2.8	J	2	J		yes	yes
	NDW06MW02	05/02/00	2	J	1.8	J		yes	no
CALCIUM	NDW06MW01	09/05/03	1070000	=	997000	=	NA	na	na
	NDW06MW06	09/05/03	954000	=	938000	=		na	na
	NDW06MW01	05/02/00	942000	=	644000	=		na	na
	NDW06MW05	09/05/03	758000	=	724000	=		na	na
	NDW06MW03	05/02/00	753000	=	846000	=		na	na
	NDW06MW04	05/02/00	735000	=	732000	=		na	na
	NDW06MW04	09/07/03	711000	=	698000	=		na	na
	NDW06MW03	09/05/03	682000	=	693000	=		na	na
	NDW06MW02	05/02/00	625000	=	777000	=		na	na
	NDW06MW02	09/05/03	355000	=	332000	=		na	na
CHROMIUM, TOTAL	NDW06MW05	09/05/03	58.8	J	ND		NA	na	na
	NDW06MW06	09/05/03	37.4	J	9.19	J		na	na
	NDW06MW01	09/05/03	13.7	J	ND			na	na
	NDW06MW04	05/02/00	8.9	J	ND			na	na
	NDW06MW01	05/02/00	5.7	J	4.7	J		na	na
	NDW06MW02	05/02/00	4.2	J	ND			na	na
	NDW06MW03	05/02/00	2.7	J	ND			na	na
	NDW06MW02	09/05/03	ND		12.4	J		na	na
	NDW06MW03	09/05/03	ND		8.91	J		na	na
	NDW06MW04	05/02/00	ND		4.5	J		na	na
	NDW06MW04	09/07/03	ND		19.8	J		na	na
COBALT	NDW06MW05	09/05/03	59.9	J	6.85	J	73	no	no
	NDW06MW06	09/05/03	36.6	J	ND			no	no
	NDW06MW01	09/05/03	12.3	J	ND			no	no
	NDW06MW01	05/02/00	4	J	0.55	J		no	no
	NDW06MW04	05/02/00	1.7	J	0.92	J		no	no
	NDW06MW02	09/05/03	ND		7.27	J		no	no
	NDW06MW03	09/05/03	ND		7.55	J		no	no
	NDW06MW04	09/07/03	ND		25.5	J		no	no
COPPER	NDW06MW05	09/05/03	33.6	J	ND		146	no	no
	NDW06MW01	09/05/03	18.7	J	ND			no	no

Table I-2
Detected Chemicals in Groundwater
SWMU 6, Naval Ammunition Support Detachment
SWMU 6 Former NASD, Vieques Island, Puerto Rico

Chemical	Station ID	Sample Date	Concentration				Region IX PRG [1]	PRG Exceedances	
			Total	Qualifer	Dissolved	Qualifer		Total	Dissolved
	NDW06MW02	05/02/00	10	J	ND			no	no
IRON	NDW06MW03	09/05/03	6090	J	5230	J	1090	yes	yes
	NDW06MW02	05/02/00	2500	J	12.7	J		yes	no
	NDW06MW02	09/05/03	2040	J	2320	J		yes	yes
	NDW06MW05	09/05/03	584	J	338	J		no	no
	NDW06MW01	05/02/00	324	J	ND			no	no
	NDW06MW04	05/02/00	55.5	J	ND			no	no
	NDW06MW03	05/02/00	43	J	ND			no	no
LEAD	NDW06MW06	09/05/03	134	=	ND		NA	na	no
	NDW06MW02	09/05/03	97	=	210	J		na	na
	NDW06MW05	09/05/03	71	J	260	J		na	na
	NDW06MW01	09/05/03	62.2	=	218	J		na	na
	NDW06MW03	09/05/03	41	=	ND			na	na
	NDW06MW02	05/02/00	25.2	=	2.7	J		na	na
	NDW06MW04	05/02/00	4.3	=	2.6	J		na	na
	NDW06MW01	05/02/00	3.5	=	3	J		na	na
	NDW06MW03	05/02/00	1.8	J	3.8	=		na	na
MAGNESIUM	NDW06MW01	09/05/03	2990000	=	2770000	=	NA	na	na
	NDW06MW06	09/05/03	2710000	=	2580000	=		na	na
	NDW06MW02	09/05/03	2360000	=	2190000	=		na	na
	NDW06MW03	09/05/03	2220000	=	2230000	=		na	na
	NDW06MW01	05/02/00	2210000	=	2090000	=		na	na
	NDW06MW03	05/02/00	2140000	=	2330000	=		na	na
	NDW06MW05	09/05/03	2120000	=	1970000	=		na	na
	NDW06MW02	05/02/00	2020000	=	2180000	=		na	na
	NDW06MW04	05/02/00	1960000	=	1950000	=		na	na
	NDW06MW04	09/07/03	1910000	=	1900000	=		na	na
MANGANESE	NDW06MW01	05/02/00	14300	=	11800	=	87.6	yes	yes
	NDW06MW04	05/02/00	13800	=	10600	=		yes	yes
	NDW06MW02	05/02/00	2070	=	2070	=		yes	yes
	NDW06MW03	05/02/00	1380	=	1170	=		yes	yes
	NDW06MW05	09/05/03	1100	=	1070	=		yes	yes
	NDW06MW03	09/05/03	1090	=	1070	=		yes	yes
	NDW06MW06	09/05/03	843	=	766	=		yes	yes
	NDW06MW01	09/05/03	529	=	499	=		yes	yes
	NDW06MW02	09/05/03	442	=	432	=		yes	yes

Table I-2
Detected Chemicals in Groundwater
SWMU 6, Naval Ammunition Support Detachment
SWMU 6 Former NASD, Vieques Island, Puerto Rico

Chemical	Station ID	Sample Date	Concentration				Region IX PRG [1]	PRG Exceedances	
			Total	Qualifer	Dissolved	Qualifer		Total	Dissolved
	NDW06MW04	09/07/03	339	=	315	J		yes	yes
MERCURY	NDW06MW06	09/05/03	0.0213	J	0.0336	J	1.09	no	no
	NDW06MW01	09/05/03	ND		0.054	J		no	no
	NDW06MW02	09/05/03	ND		0.0475	J		no	no
	NDW06MW04	09/07/03	ND		0.0241	J		no	no
	NDW06MW05	09/05/03	ND		0.0251	J		no	no
NICKEL	NDW06MW05	09/05/03	26.6	J	ND		73	no	no
	NDW06MW04	05/02/00	4.4	J	4	J		no	no
	NDW06MW02	05/02/00	3.7	J	2.1	J		no	no
	NDW06MW01	05/02/00	2.7	J	1.6	J		no	no
	NDW06MW03	05/02/00	1.5	J	1	J		no	no
POTASSIUM	NDW06MW01	09/05/03	1050000	=	1080000	J	NA	na	na
	NDW06MW02	09/05/03	1040000	=	1080000	J		na	na
	NDW06MW06	09/05/03	1020000	=	918000	J		na	na
	NDW06MW03	09/05/03	965000	=	1010000	J		na	na
	NDW06MW05	09/05/03	930000	=	869000	J		na	na
	NDW06MW04	09/07/03	854000	J	743000	J		na	na
SELENIUM	NDW06MW06	09/05/03	191	=	ND		18.2	yes	no
	NDW06MW02	09/05/03	133	=	ND			yes	no
	NDW06MW05	09/05/03	127	J	253	J		yes	yes
	NDW06MW03	09/05/03	103	=	258	J		yes	yes
	NDW06MW01	09/05/03	93.1	=	ND			yes	no
	NDW06MW01	05/02/00	7.2	=	5.7	=		no	no
	NDW06MW04	05/02/00	7.1	=	6.4	=		no	no
	NDW06MW03	05/02/00	5.9	=	ND			no	no
	NDW06MW02	05/02/00	2.9	J	5	J		no	no
	NDW06MW04	09/07/03	ND		110	J		no	yes
SILVER	NDW06MW05	09/05/03	56.4	J	ND		18.2	yes	no
	NDW06MW02	09/05/03	12.6	J	ND			no	no
	NDW06MW01	09/05/03	6.71	J	ND			no	no
	NDW06MW04	05/02/00	ND		2.1	J		no	no
	NDW06MW01	05/02/00	ND		0.93	J		no	no
SODIUM	NDW06MW01	09/05/03	19200000	J	18900000	=	NA	na	na
	NDW06MW02	05/02/00	16600000	=	16800000	=		na	na
	NDW06MW02	09/05/03	16100000	J	17000000	=		na	na
	NDW06MW01	05/02/00	15600000	=	15100000	=		na	na

Table I-2
Detected Chemicals in Groundwater
SWMU 6, Naval Ammunition Support Detachment
SWMU 6 Former NASD, Vieques Island, Puerto Rico

Chemical	Station ID	Sample Date	Concentration				Region IX PRG [1]	PRG Exceedances	
			Total	Qualifer	Dissolved	Qualifer		Total	Dissolved
	NDW06MW04	05/02/00	15500000	=	15000000	=		na	na
	NDW06MW03	05/02/00	15400000	=	16400000	=		na	na
	NDW06MW06	09/05/03	15400000	J	14900000	=		na	na
	NDW06MW04	09/07/03	14900000	=	13700000	=		na	na
	NDW06MW03	09/05/03	14600000	J	15800000	=		na	na
	NDW06MW05	09/05/03	13500000	J	13400000	=		na	na
THALLIUM	NDW06MW05	09/05/03	60.4	J	ND		0.241	yes	no
	NDW06MW04	09/07/03	56.5	J	ND			yes	no
VANADIUM	NDW06MW05	09/05/03	15.4	J	ND		25.5	no	no
	NDW06MW02	05/02/00	9.9	J	4.5	J		no	no
	NDW06MW04	05/02/00	7.5	J	8.1	J		no	no
	NDW06MW03	05/02/00	6	J	4.8	J		no	no
	NDW06MW01	05/02/00	3.7	J	2.7	J		no	no
ZINC	NDW06MW04	05/02/00	177	=	ND		1090	no	no
Volatile Organic Compounds (ug/L)									
CHLOROFORM	NDW06MW01	09/05/03	1.1	=	-		0.617	yes	na
	NDW06MW06	09/05/03	0.53	=	-			no	na
Semivolatile Organic Compounds (ug/L)									
2-METHYLNAPHTHALENE	NDW06MW01	09/05/03	0.45	J	-		12	no	na
CAPROLACTAM	NDW06MW01	09/05/03	37.4	J	-		1820	no	na
	NDW06MW03	09/05/03	1.3	J	-			no	na
DI-n-OCTYLPHTHALATE	NDW06MW04	09/07/03	4.9	J	-		146	no	na
NAPHTHALENE	NDW06MW01	09/05/03	0.39	J	-		0.62	no	na
Polychlorinated Biphenyls (ug/L)									
PCB-1221 (AROCHLOR 1221)	NDW06MW04	05/02/00	0.7	=	-		0.0336	yes	na
PCB-1232 (AROCHLOR 1232)	NDW06MW04	05/02/00	0.09	J	-		0.0336	yes	na
Perchlorate (ug/L)									
Perchlorate	NDW06MW01	09/05/03	12.8	J	-		0.365	yes	na

[1] USEPA Region IX tap water PRG (2002) based on a hazard index (HI) of 0.1 for non-carcinogens.
ND indicates that the chemical was not detected.
NA indicates that the information is not available or not applicable.
J indicates that the chemical was detected. The reported value is estimated.
= infdicates that the chemical was detected. The reported value is the measured concentration.

Table I-2
Detected Chemicals in Surface Water
SWMU 6, Naval Ammunition Support Detachment
SWMU 6 Former NASD, Vieques Island, Puerto Rico

Chemical	Station ID	Sample Date	Concentration				Ecological Criteria [1]	ECO Exceedances	
			Total	Qualifer	Dissolved	Qualifer		Total	Dissolved
Metals (ug/L)									
ALUMINUM	NDW06SW01	04/13/00	1820	=	-		NA	na	na
	NDW06SW02	04/13/00	1440	=	-			na	na
	NDW06SW02	10/01/03	709	J	ND			na	no
	NDW06SW03A	04/13/00	1680	=	-			na	na
	NDW06SW03B	10/01/03	987	J	ND			na	no
	NDW06SW04	04/13/00	2020	=	-			na	na
	NDW06SW05A	04/13/00	1370	=	-			na	na
	NDW06SW05B	10/01/03	819	J	ND			na	no
	NDW06SW06A	04/13/00	2260	=	-			na	na
	NDW06SW06B	09/29/03	1730	J	ND			na	no
	NDW06SW07A	04/13/00	2970	=	-			na	na
	NDW06SW07B	09/29/03	2360	J	ND			na	no
ARSENIC	NDW06SW02	04/13/00	3.8	J	-		1.4	yes	na
	NDW06SW05A	04/13/00	5	J	-			yes	na
	NDW06SW06A	04/13/00	5.3	J	-			yes	na
BARIUM	NDW06SW01	04/13/00	12.7	J	-		NA	na	na
	NDW06SW02	04/13/00	11.9	J	-			na	na
	NDW06SW02	10/01/03	10.3	J	ND			na	no
	NDW06SW03A	04/13/00	12.3	J	-			na	na
	NDW06SW03B	10/01/03	11.3	J	ND			na	no
	NDW06SW04	04/13/00	13.5	J	-			na	na
	NDW06SW05A	04/13/00	12.2	J	-			na	na
	NDW06SW05B	10/01/03	11.4	J	ND			na	no
	NDW06SW06A	04/13/00	13.8	J	-			na	na
	NDW06SW06B	09/29/03	13.7	J	ND			na	no
	NDW06SW07A	04/13/00	15.1	J	-			na	na
	NDW06SW07B	09/29/03	13.8	J	ND			na	no
	NDW06SW08	10/01/03	11.3	J	ND			na	no
CADMIUM	NDW06SW01	04/13/00	1.9	J	-		9.3	no	na

Table I-2
Detected Chemicals in Surface Water
SWMU 6, Naval Ammunition Support Detachment
SWMU 6 Former NASD, Vieques Island, Puerto Rico

Chemical	Station ID	Sample Date	Concentration				Ecological Criteria [1]	ECO Exceedances	
			Total	Qualifer	Dissolved	Qualifer		Total	Dissolved
	NDW06SW02	04/13/00	1.9	J	-			no	na
	NDW06SW03A	04/13/00	2	J	-			no	na
	NDW06SW04	04/13/00	2	J	-			no	na
	NDW06SW05A	04/13/00	2	J	-			no	na
	NDW06SW06A	04/13/00	1.9	J	-			no	na
	NDW06SW07A	04/13/00	1.9	J	-			no	na
CALCIUM	NDW06SW01	04/13/00	476000	J	-		NA	na	na
	NDW06SW02	04/13/00	463000	J	-			na	na
	NDW06SW02	10/01/03	435000	J	419000	J		na	na
	NDW06SW03A	04/13/00	464000	J	-			na	na
	NDW06SW03B	10/01/03	440000	J	413000	J		na	na
	NDW06SW04	04/13/00	465000	J	-			na	na
	NDW06SW05A	04/13/00	470000	J	-			na	na
	NDW06SW05B	10/01/03	441000	J	403000	J		na	na
	NDW06SW06A	04/13/00	469000	J	-			na	na
	NDW06SW06B	09/29/03	442000	J	409000	J		na	na
	NDW06SW07A	04/13/00	487000	J	-			na	na
	NDW06SW07B	09/29/03	438000	J	403000	J		na	na
	NDW06SW08	10/01/03	452000	J	412000	J		na	na
	NDW06SW09	10/01/03	434000	J	397000	J		na	na
CHROMIUM, TOTAL	NDW06SW01	04/13/00	1.1	J	-		50.4	no	na
	NDW06SW03A	04/13/00	1.1	J	-			no	na
	NDW06SW04	04/13/00	0.63	J	-			no	na
	NDW06SW05A	04/13/00	0.58	J	-			no	na
	NDW06SW07A	04/13/00	0.51	J	-			no	na
COBALT	NDW06SW03A	04/13/00	1.1	J	-		NA	na	na
	NDW06SW07A	04/13/00	0.71	J	-			na	na
COPPER	NDW06SW02	04/13/00	4.6	J	-		3.7	yes	na
	NDW06SW03A	04/13/00	1.9	J	-			no	na
	NDW06SW04	04/13/00	2	J	-			no	na

Table I-2
Detected Chemicals in Surface Water
SWMU 6, Naval Ammunition Support Detachment
SWMU 6 Former NASD, Vieques Island, Puerto Rico

Chemical	Station ID	Sample Date	Concentration				Ecological Criteria [1]	ECO Exceedances	
			Total	Qualifer	Dissolved	Qualifer		Total	Dissolved
	NDW06SW05A	04/13/00	2.2	J	-			no	na
	NDW06SW06A	04/13/00	5	J	-			yes	na
	NDW06SW06B	09/29/03	23.7	J	ND			yes	no
	NDW06SW07B	09/29/03	38.9	J	ND			yes	no
IRON	NDW06SW01	04/13/00	887	J	-		NA	na	na
	NDW06SW02	04/13/00	700	J	-			na	na
	NDW06SW03A	04/13/00	761	J	-			na	na
	NDW06SW04	04/13/00	883	J	-			na	na
	NDW06SW05A	04/13/00	614	J	-			na	na
	NDW06SW06A	04/13/00	979	J	-			na	na
	NDW06SW07A	04/13/00	1410	J	-			na	na
LEAD	NDW06SW02	04/13/00	1.6	J	-		8.1	no	na
	NDW06SW04	04/13/00	1.2	J	-			no	na
	NDW06SW06A	04/13/00	14.7	=	-			yes	na
	NDW06SW07A	04/13/00	1.7	J	-			no	na
MAGNESIUM	NDW06SW01	04/13/00	1510000	=	-		NA	na	na
	NDW06SW02	04/13/00	1470000	=	-			na	na
	NDW06SW02	10/01/03	1310000	J	1270000	J		na	na
	NDW06SW03A	04/13/00	1460000	=	-			na	na
	NDW06SW03B	10/01/03	1320000	J	1250000	J		na	na
	NDW06SW04	04/13/00	1460000	=	-			na	na
	NDW06SW05A	04/13/00	1470000	=	-			na	na
	NDW06SW05B	10/01/03	1330000	J	1230000	J		na	na
	NDW06SW06A	04/13/00	1470000	=	-			na	na
	NDW06SW06B	09/29/03	1330000	J	1250000	J		na	na
	NDW06SW07A	04/13/00	1540000	=	-			na	na
	NDW06SW07B	09/29/03	1320000	J	1240000	J		na	na
	NDW06SW08	10/01/03	1350000	J	1240000	J		na	na
	NDW06SW09	10/01/03	1320000	J	1220000	J		na	na
MANGANESE	NDW06SW01	04/13/00	25.7	J	-		NA	na	na

Table I-2
Detected Chemicals in Surface Water
SWMU 6, Naval Ammunition Support Detachment
SWMU 6 Former NASD, Vieques Island, Puerto Rico

Chemical	Station ID	Sample Date	Concentration				Ecological Criteria [1]	ECO Exceedances	
			Total	Qualifer	Dissolved	Qualifer		Total	Dissolved
	NDW06SW02	04/13/00	19.8	J	-			na	na
	NDW06SW02	10/01/03	13.1	J	14.9	J		na	na
	NDW06SW03A	04/13/00	18.1	J	-			na	na
	NDW06SW03B	10/01/03	18.4	J	ND			na	no
	NDW06SW04	04/13/00	18.9	J	-			na	na
	NDW06SW05A	04/13/00	5.3	J	-			na	na
	NDW06SW05B	10/01/03	27	J	17.4	J		na	na
	NDW06SW06A	04/13/00	21.3	J	-			na	na
	NDW06SW06B	09/29/03	22.7	J	ND			na	no
	NDW06SW07A	04/13/00	30.8	J	-			na	na
	NDW06SW07B	09/29/03	42	J	6.13	J		na	na
	NDW06SW08	10/01/03	35.4	J	24.5	J		na	na
MERCURY	NDW06SW02	10/01/03	0.018	J	0.0316	J	0.051	no	no
	NDW06SW03A	04/13/00	1.6	J	-			yes	na
	NDW06SW03B	10/01/03	0.0174	J	0.0256	J		no	no
	NDW06SW05B	10/01/03	0.0174	J	0.0452	J		no	no
	NDW06SW06B	09/29/03	0.0218	J	0.032	J		no	no
	NDW06SW07B	09/29/03	0.0172	J	0.0241	J		no	no
	NDW06SW08	10/01/03	0.0188	J	0.0242	J		no	no
NICKEL	NDW06SW02	04/13/00	1.1	J	-		8.2	no	na
	NDW06SW02	10/01/03	ND		52	J		no	yes
	NDW06SW07A	04/13/00	0.96	J	-			no	na
POTASSIUM	NDW06SW02	10/01/03	688000	J	667000	J	NA	na	na
	NDW06SW03B	10/01/03	700000	J	663000	J		na	na
	NDW06SW05A	04/13/00	412000	=	-			na	na
	NDW06SW05B	10/01/03	704000	J	647000	J		na	na
	NDW06SW06B	09/29/03	702000	J	660000	J		na	na
	NDW06SW07B	09/29/03	699000	J	648000	J		na	na
	NDW06SW08	10/01/03	709000	J	652000	J		na	na
	NDW06SW09	10/01/03	700000	J	648000	J		na	na

Table I-2
Detected Chemicals in Surface Water
SWMU 6, Naval Ammunition Support Detachment
SWMU 6 Former NASD, Vieques Island, Puerto Rico

Chemical	Station ID	Sample Date	Concentration				Ecological Criteria [1]	ECO Exceedances	
			Total	Qualifer	Dissolved	Qualifer		Total	Dissolved
SELENIUM	NDW06SW01	04/13/00	5.2	=	-		71	no	na
	NDW06SW02	04/13/00	5.6	=	-			no	na
	NDW06SW03A	04/13/00	6.4	=	-			no	na
	NDW06SW04	04/13/00	2.7	J	-			no	na
	NDW06SW05A	04/13/00	4.2	J	-			no	na
	NDW06SW06A	04/13/00	4	J	-			no	na
	NDW06SW07A	04/13/00	3.8	J	-			no	na
SILVER	NDW06SW05A	04/13/00	7.1	J	-		1.9	yes	na
SODIUM	NDW06SW01	04/13/00	11900000	J	-		NA	na	na
	NDW06SW02	04/13/00	11500000	J	-			na	na
	NDW06SW02	10/01/03	10400000	J	10400000	J		na	na
	NDW06SW03A	04/13/00	11600000	J	-			na	na
	NDW06SW03B	10/01/03	10600000	J	10300000	J		na	na
	NDW06SW04	04/13/00	11700000	J	-			na	na
	NDW06SW05A	04/13/00	11500000	J	-			na	na
	NDW06SW05B	10/01/03	10700000	J	10100000	J		na	na
	NDW06SW06A	04/13/00	11600000	J	-			na	na
	NDW06SW06B	09/29/03	10600000	J	10300000	J		na	na
	NDW06SW07A	04/13/00	12100000	J	-			na	na
	NDW06SW07B	09/29/03	10600000	J	10100000	J		na	na
	NDW06SW08	10/01/03	10800000	J	10200000	J		na	na
	NDW06SW09	10/01/03	10600000	J	10300000	J		na	na
THALLIUM	NDW06SW02	04/13/00	4.9	J	-		NA	na	na
VANADIUM	NDW06SW01	04/13/00	3.3	J	-		NA	na	na
	NDW06SW02	04/13/00	3.6	J	-			na	na
	NDW06SW03A	04/13/00	2.5	J	-			na	na
	NDW06SW04	04/13/00	4	J	-			na	na
	NDW06SW05A	04/13/00	3.7	J	-			na	na
	NDW06SW06A	04/13/00	4.5	J	-			na	na
	NDW06SW07A	04/13/00	5.8	J	-			na	na

Table I-2
Detected Chemicals in Surface Water
SWMU 6, Naval Ammunition Support Detachment
SWMU 6 Former NASD, Vieques Island, Puerto Rico

Chemical	Station ID	Sample Date	Concentration				Ecological Criteria [1]	ECO Exceedances	
			Total	Qualifer	Dissolved	Qualifer		Total	Dissolved
Semivolatile Organic Compounds (ug/L)									
DIETHYL PHTHALATE	NDW06SW01	04/13/00	0.6	J	-		23000	no	na
	NDW06SW02	04/13/00	0.5	J	-			no	na
	NDW06SW03A	04/13/00	0.5	J	-			no	na
DI-n-OCTYLPHTHALATE	NDW06SW09	10/01/03	6	=	-		NA	na	na

[1] The lower of the USEPA National Recommended Water Quality Criteria (USEPA, 2002) and the Puerto Rico Environmental Quality Board (EQB) Water
ND indicates that the chemical was not detected.
NA indicates that the information is not available or not applicable.
J indicates that the chemical was detected. The reported value is estimated.
= infdicates that the chemical was detected. The reported value is the measured concentration.

Table I-2
Detected Chemicals in Sediment
SWMU 6, Naval Ammunition Support Detachment
SWMU 6 Former NASD, Vieques Island, Puerto Rico

Chemical	Station ID	Sample Date	Result	Qualifer	Ecological Criteria [1]	Exceedances of ECO
		Metals (mg/Kg)				
ALUMINUM	NDW06SD03A	04/13/00	19300	=	NA	na
	NDW06SD07A	04/13/00	17800	=		na
	NDW06SD05A	04/13/00	14800	=		na
	NDW06SD07B	09/04/03	12700	J		na
	NDW06SD05B	09/03/03	12400	J		na
	NDW06SD04	04/13/00	12300	=		na
	NDW06SD03B	09/03/03	10800	J		na
	NDW06SD08	09/04/03	10300	J		na
	NDW06SD01	04/13/00	8400	=		na
	NDW06SD09	09/04/03	7890	J		na
	NDW06SD02	04/13/00	6890	=		na
	NDW06SD06B	09/04/03	6260	J		na
	NDW06SD06A	04/13/00	5680	=		na
	NDW06SD12	09/04/03	5360	=		na
	NDW06SD13	09/03/03	4630	=		na
	NDW06SD14	09/03/03	3860	=		na
	NDW06SD10	09/04/03	3020	=		na
	NDW06SD11	09/03/03	2340	=		na
	NDW06SD02	09/03/03	1810	=		na
ANTIMONY	NDW06SD02	04/13/00	97.8	J	12	yes
	NDW06SD10	09/04/03	0.933	J		no
	NDW06SD09	09/04/03	0.871	J		no
	NDW06SD03A	04/13/00	0.85	J		no
	NDW06SD07B	09/04/03	0.766	J		no
	NDW06SD01	04/13/00	0.72	J		no
	NDW06SD14	09/03/03	0.68	J		no
	NDW06SD02	09/03/03	0.645	J		no
	NDW06SD08	09/04/03	0.602	J		no
	NDW06SD11	09/03/03	0.585	J		no

Table I-2
Detected Chemicals in Sediment
SWMU 6, Naval Ammunition Support Detachment
SWMU 6 Former NASD, Vieques Island, Puerto Rico

Chemical	Station ID	Sample Date	Result	Qualifer	Ecological Criteria [1]	Exceedances of ECO
	NDW06SD03B	09/03/03	0.571	J		no
	NDW06SD12	09/04/03	0.564	J		no
	NDW06SD13	09/03/03	0.538	J		no
	NDW06SD06B	09/04/03	0.312	J		no
	NDW06SD05B	09/03/03	0.307	J		no
ARSENIC	NDW06SD02	04/13/00	555	=	7.24	yes
	NDW06SD08	09/04/03	13.5	J		yes
	NDW06SD07B	09/04/03	8.78	J		yes
	NDW06SD09	09/04/03	6.35	J		no
	NDW06SD03A	04/13/00	5.9	J		no
	NDW06SD04	04/13/00	5.8	J		no
	NDW06SD05A	04/13/00	5.2	J		no
	NDW06SD05B	09/03/03	5.07	J		no
	NDW06SD06B	09/04/03	4.95	J		no
	NDW06SD07A	04/13/00	4	J		no
	NDW06SD12	09/04/03	2.64	=		no
	NDW06SD10	09/04/03	2.56	=		no
	NDW06SD01	04/13/00	2.3	J		no
	NDW06SD03B	09/03/03	1.91	J		no
	NDW06SD14	09/03/03	1.86	J		no
	NDW06SD13	09/03/03	1.85	J		no
	NDW06SD11	09/03/03	1.51	J		no
	NDW06SD02	09/03/03	1.33	J		no
	NDW06SD06A	04/13/00	1.1	J		no
BARIUM	NDW06SD02	04/13/00	571	=	20	yes
	NDW06SD06A	04/13/00	17.3	J		no
	NDW06SD03A	04/13/00	14.7	J		no
	NDW06SD07A	04/13/00	14.4	J		no
	NDW06SD07B	09/04/03	13.3	J		no
	NDW06SD05A	04/13/00	11.9	J		no

Table I-2
Detected Chemicals in Sediment
SWMU 6, Naval Ammunition Support Detachment
SWMU 6 Former NASD, Vieques Island, Puerto Rico

Chemical	Station ID	Sample Date	Result	Qualifer	Ecological Criteria [1]	Exceedances of ECO
	NDW06SD04	04/13/00	10.7	J		no
	NDW06SD08	09/04/03	9.99	J		no
	NDW06SD05B	09/03/03	9.47	J		no
	NDW06SD10	09/04/03	8.86	J		no
	NDW06SD03B	09/03/03	8.65	J		no
	NDW06SD09	09/04/03	8.55	J		no
	NDW06SD06B	09/04/03	7.69	J		no
	NDW06SD14	09/03/03	6.08	J		no
	NDW06SD11	09/03/03	6.07	J		no
	NDW06SD12	09/04/03	6.03	J		no
	NDW06SD13	09/03/03	5.8	J		no
	NDW06SD01	04/13/00	5.1	J		no
	NDW06SD02	09/03/03	4.48	J		no
BERYLLIUM	NDW06SD02	04/13/00	14.2	=	NA	na
	NDW06SD07B	09/04/03	0.517	J		na
	NDW06SD08	09/04/03	0.393	J		na
	NDW06SD05B	09/03/03	0.306	J		na
	NDW06SD07A	04/13/00	0.29	J		na
	NDW06SD09	09/04/03	0.267	J		na
	NDW06SD06B	09/04/03	0.252	J		na
	NDW06SD03A	04/13/00	0.25	J		na
	NDW06SD05A	04/13/00	0.25	J		na
	NDW06SD03B	09/03/03	0.202	J		na
	NDW06SD04	04/13/00	0.18	J		na
	NDW06SD06A	04/13/00	0.16	J		na
	NDW06SD12	09/04/03	0.105	J		na
	NDW06SD01	04/13/00	0.082	J		na
	NDW06SD14	09/03/03	0.0696	J		na
	NDW06SD13	09/03/03	0.0691	J		na
	NDW06SD10	09/04/03	0.0563	J		na

Table I-2
Detected Chemicals in Sediment
SWMU 6, Naval Ammunition Support Detachment
SWMU 6 Former NASD, Vieques Island, Puerto Rico

Chemical	Station ID	Sample Date	Result	Qualifer	Ecological Criteria [1]	Exceedances of ECO
	NDW06SD02	09/03/03	0.0433	J		na
	NDW06SD11	09/03/03	0.0417	J		na
CADMIUM	NDW06SD02	04/13/00	13.7	=	1.2	yes
	NDW06SD05B	09/03/03	0.558	J		no
	NDW06SD10	09/04/03	0.424	J		no
	NDW06SD08	09/04/03	0.131	J		no
	NDW06SD09	09/04/03	0.111	J		no
	NDW06SD07B	09/04/03	0.109	J		no
	NDW06SD03B	09/03/03	0.0629	J		no
	NDW06SD12	09/04/03	0.0503	J		no
	NDW06SD06B	09/04/03	0.0465	J		no
	NDW06SD11	09/03/03	0.0351	J		no
	NDW06SD14	09/03/03	0.0262	J		no
	NDW06SD13	09/03/03	0.0252	J		no
CALCIUM	NDW06SD14	09/03/03	135000	=	NA	na
	NDW06SD11	09/03/03	127000	=		na
	NDW06SD02	09/03/03	115000	=		na
	NDW06SD10	09/04/03	107000	=		na
	NDW06SD12	09/04/03	99600	=		na
	NDW06SD13	09/03/03	98500	=		na
	NDW06SD03B	09/03/03	72500	J		na
	NDW06SD09	09/04/03	71000	J		na
	NDW06SD07B	09/04/03	64900	J		na
	NDW06SD02	04/13/00	55800	=		na
	NDW06SD08	09/04/03	53600	J		na
	NDW06SD03A	04/13/00	46100	=		na
	NDW06SD04	04/13/00	38600	=		na
	NDW06SD01	04/13/00	30100	=		na
	NDW06SD05A	04/13/00	30100	=		na
	NDW06SD05B	09/03/03	22600	J		na

Table I-2
Detected Chemicals in Sediment
SWMU 6, Naval Ammunition Support Detachment
SWMU 6 Former NASD, Vieques Island, Puerto Rico

Chemical	Station ID	Sample Date	Result	Qualifer	Ecological Criteria [1]	Exceedances of ECO
	NDW06SD06B	09/04/03	19400	J		na
	NDW06SD07A	04/13/00	14600	=		na
	NDW06SD06A	04/13/00	1630	=		na
CHROMIUM, TOTAL	NDW06SD02	04/13/00	67.8	=	81	no
	NDW06SD01	04/13/00	32.4	=		no
	NDW06SD10	09/04/03	18.9	=		no
	NDW06SD03A	04/13/00	16.9	=		no
	NDW06SD05A	04/13/00	15.6	=		no
	NDW06SD05B	09/03/03	14	J		no
	NDW06SD04	04/13/00	13.9	=		no
	NDW06SD07A	04/13/00	12.9	=		no
	NDW06SD07B	09/04/03	11	J		no
	NDW06SD08	09/04/03	10.4	J		no
	NDW06SD13	09/03/03	7.94	=		no
	NDW06SD09	09/04/03	7.88	J		no
	NDW06SD03B	09/03/03	7.54	J		no
	NDW06SD06B	09/04/03	6.11	J		no
	NDW06SD12	09/04/03	6.11	=		no
	NDW06SD06A	04/13/00	4.6	=		no
	NDW06SD14	09/03/03	3.16	=		no
	NDW06SD11	09/03/03	2.72	=		no
	NDW06SD02	09/03/03	1.99	J		no
COBALT	NDW06SD02	04/13/00	142	=	NA	na
	NDW06SD08	09/04/03	12.2	J		na
	NDW06SD07B	09/04/03	10.4	J		na
	NDW06SD06B	09/04/03	7.58	J		na
	NDW06SD07A	04/13/00	7.3	J		na
	NDW06SD03A	04/13/00	6.9	J		na
	NDW06SD05A	04/13/00	6.5	J		na
	NDW06SD01	04/13/00	6.2	J		na

Table I-2
Detected Chemicals in Sediment
SWMU 6, Naval Ammunition Support Detachment
SWMU 6 Former NASD, Vieques Island, Puerto Rico

Chemical	Station ID	Sample Date	Result	Qualifer	Ecological Criteria [1]	Exceedances of ECO
	NDW06SD04	04/13/00	6.1	J		na
	NDW06SD09	09/04/03	5.96	J		na
	NDW06SD05B	09/03/03	5.69	J		na
	NDW06SD03B	09/03/03	3.31	J		na
	NDW06SD12	09/04/03	2.65	J		na
	NDW06SD13	09/03/03	2.48	J		na
	NDW06SD10	09/04/03	1.86	J		na
	NDW06SD06A	04/13/00	1.7	J		na
	NDW06SD14	09/03/03	1.43	J		na
	NDW06SD11	09/03/03	1.29	J		na
	NDW06SD02	09/03/03	0.917	J		na
COPPER	NDW06SD02	04/13/00	101	=	18.7	yes
	NDW06SD10	09/04/03	82.4	=		yes
	NDW06SD11	09/03/03	41.5	=		yes
	NDW06SD03A	04/13/00	37.8	=		yes
	NDW06SD12	09/04/03	37.4	=		yes
	NDW06SD05A	04/13/00	34.4	=		yes
	NDW06SD04	04/13/00	29.8	=		yes
	NDW06SD05B	09/03/03	29.8	J		yes
	NDW06SD07A	04/13/00	28.9	=		yes
	NDW06SD07B	09/04/03	26.4	J		yes
	NDW06SD01	04/13/00	22.8	=		yes
	NDW06SD08	09/04/03	22	J		yes
	NDW06SD09	09/04/03	16.8	J		no
	NDW06SD03B	09/03/03	14.4	J		no
	NDW06SD13	09/03/03	13.9	=		no
	NDW06SD06B	09/04/03	13.3	J		no
	NDW06SD06A	04/13/00	9.1	=		no
	NDW06SD14	09/03/03	5.57	J		no
	NDW06SD02	09/03/03	2.87	J		no

Table I-2
Detected Chemicals in Sediment
SWMU 6, Naval Ammunition Support Detachment
SWMU 6 Former NASD, Vieques Island, Puerto Rico

Chemical	Station ID	Sample Date	Result	Qualifer	Ecological Criteria [1]	Exceedances of ECO
IRON	NDW06SD03A	04/13/00	25700	=	NA	na
	NDW06SD08	09/04/03	24400	J		na
	NDW06SD05A	04/13/00	23900	=		na
	NDW06SD05B	09/03/03	23300	J		na
	NDW06SD07B	09/04/03	22600	J		na
	NDW06SD07A	04/13/00	22400	=		na
	NDW06SD04	04/13/00	21900	=		na
	NDW06SD09	09/04/03	15000	J		na
	NDW06SD01	04/13/00	13100	=		na
	NDW06SD06B	09/04/03	12400	J		na
	NDW06SD03B	09/03/03	12200	J		na
	NDW06SD10	09/04/03	11100	=		na
	NDW06SD02	04/13/00	10500	=		na
	NDW06SD13	09/03/03	7590	=		na
	NDW06SD12	09/04/03	7510	=		na
	NDW06SD06A	04/13/00	5110	=		na
	NDW06SD14	09/03/03	4480	=		na
	NDW06SD11	09/03/03	3750	=		na
	NDW06SD02	09/03/03	2640	=		na
LEAD	NDW06SD02	04/13/00	144	=	30.2	yes
	NDW06SD10	09/04/03	95.5	=		yes
	NDW06SD03A	04/13/00	21.8	=		no
	NDW06SD05B	09/03/03	21.5	J		no
	NDW06SD13	09/03/03	16.9	=		no
	NDW06SD05A	04/13/00	14.2	=		no
	NDW06SD04	04/13/00	13.8	=		no
	NDW06SD07B	09/04/03	9.47	J		no
	NDW06SD08	09/04/03	9.11	J		no
	NDW06SD07A	04/13/00	8.3	=		no
	NDW06SD03B	09/03/03	5.11	J		no

Table I-2
Detected Chemicals in Sediment
SWMU 6, Naval Ammunition Support Detachment
SWMU 6 Former NASD, Vieques Island, Puerto Rico

Chemical	Station ID	Sample Date	Result	Qualifer	Ecological Criteria [1]	Exceedances of ECO
	NDW06SD09	09/04/03	5.03	J		no
	NDW06SD06B	09/04/03	4.33	J		no
	NDW06SD12	09/04/03	3.19	=		no
	NDW06SD01	04/13/00	3.1	=		no
	NDW06SD06A	04/13/00	1.5	=		no
	NDW06SD14	09/03/03	0.838	=		no
	NDW06SD02	09/03/03	0.741	=		no
	NDW06SD11	09/03/03	0.468	J		no
MAGNESIUM	NDW06SD03A	04/13/00	11600	=	NA	na
	NDW06SD07A	04/13/00	9840	=		na
	NDW06SD05A	04/13/00	9710	=		na
	NDW06SD04	04/13/00	8590	=		na
	NDW06SD07B	09/04/03	8570	J		na
	NDW06SD08	09/04/03	7870	J		na
	NDW06SD05B	09/03/03	7560	J		na
	NDW06SD01	04/13/00	6340	=		na
	NDW06SD09	09/04/03	6100	J		na
	NDW06SD03B	09/03/03	5350	J		na
	NDW06SD02	04/13/00	5260	=		na
	NDW06SD06B	09/04/03	4900	J		na
	NDW06SD12	09/04/03	4210	=		na
	NDW06SD13	09/03/03	3270	=		na
	NDW06SD10	09/04/03	3050	=		na
	NDW06SD06A	04/13/00	2670	=		na
	NDW06SD14	09/03/03	2630	=		na
	NDW06SD02	09/03/03	2510	=		na
	NDW06SD11	09/03/03	2310	=		na
MANGANESE	NDW06SD08	09/04/03	388	J	NA	na
	NDW06SD07B	09/04/03	352	J		na
	NDW06SD02	04/13/00	277	=		na

Table I-2
Detected Chemicals in Sediment
SWMU 6, Naval Ammunition Support Detachment
SWMU 6 Former NASD, Vieques Island, Puerto Rico

Chemical	Station ID	Sample Date	Result	Qualifer	Ecological Criteria [1]	Exceedances of ECO
	NDW06SD03A	04/13/00	237	=		na
	NDW06SD05A	04/13/00	237	=		na
	NDW06SD05B	09/03/03	228	J		na
	NDW06SD04	04/13/00	226	=		na
	NDW06SD07A	04/13/00	225	=		na
	NDW06SD09	09/04/03	220	J		na
	NDW06SD01	04/13/00	133	=		na
	NDW06SD06B	09/04/03	124	J		na
	NDW06SD10	09/04/03	107	=		na
	NDW06SD03B	09/03/03	106	J		na
	NDW06SD12	09/04/03	90.7	=		na
	NDW06SD13	09/03/03	82.7	=		na
	NDW06SD11	09/03/03	47.2	=		na
	NDW06SD14	09/03/03	45.3	=		na
	NDW06SD02	09/03/03	41.1	=		na
	NDW06SD06A	04/13/00	30.2	=		na
MERCURY	NDW06SD02	04/13/00	0.21	J	0.13	yes
	NDW06SD01	04/13/00	0.18	J		yes
	NDW06SD07B	09/04/03	0.119	J		no
	NDW06SD08	09/04/03	0.11	J		no
	NDW06SD09	09/04/03	0.0709	J		no
	NDW06SD05B	09/03/03	0.0644	J		no
	NDW06SD06B	09/04/03	0.0488	J		no
	NDW06SD03B	09/03/03	0.0256	J		no
	NDW06SD12	09/04/03	0.0163	J		no
	NDW06SD10	09/04/03	0.013	J		no
	NDW06SD13	09/03/03	0.00861	J		no
	NDW06SD14	09/03/03	0.00812	J		no
	NDW06SD11	09/03/03	0.00468	J		no
	NDW06SD02	09/03/03	0.00265	J		no

Table I-2
Detected Chemicals in Sediment
SWMU 6, Naval Ammunition Support Detachment
SWMU 6 Former NASD, Vieques Island, Puerto Rico

Chemical	Station ID	Sample Date	Result	Qualifer	Ecological Criteria [1]	Exceedances of ECO
NICKEL	NDW06SD02	04/13/00	143	=	15.9	yes
	NDW06SD01	04/13/00	12.6	J		no
	NDW06SD10	09/04/03	10.5	=		no
	NDW06SD03A	04/13/00	6.1	J		no
	NDW06SD07B	09/04/03	5.96	J		no
	NDW06SD05B	09/03/03	5.47	J		no
	NDW06SD05A	04/13/00	5.4	J		no
	NDW06SD08	09/04/03	5.36	J		no
	NDW06SD04	04/13/00	4.9	J		no
	NDW06SD07A	04/13/00	4.8	J		no
	NDW06SD09	09/04/03	3.62	J		no
	NDW06SD06B	09/04/03	3.61	J		no
	NDW06SD03B	09/03/03	3.08	J		no
	NDW06SD13	09/03/03	2.84	J		no
	NDW06SD12	09/04/03	2.53	J		no
	NDW06SD06A	04/13/00	1.8	J		no
	NDW06SD14	09/03/03	1.4	J		no
	NDW06SD11	09/03/03	1.07	J		no
	NDW06SD02	09/03/03	0.666	J		no
POTASSIUM	NDW06SD03A	04/13/00	6550	=	NA	na
	NDW06SD07A	04/13/00	6250	=		na
	NDW06SD05A	04/13/00	5540	=		na
	NDW06SD04	04/13/00	4530	=		na
	NDW06SD07B	09/04/03	4200	J		na
	NDW06SD08	09/04/03	3870	J		na
	NDW06SD05B	09/03/03	3830	J		na
	NDW06SD03B	09/03/03	3120	J		na
	NDW06SD09	09/04/03	2740	J		na
	NDW06SD06B	09/04/03	2310	J		na
	NDW06SD06A	04/13/00	2070	=		na

Table I-2
Detected Chemicals in Sediment
SWMU 6, Naval Ammunition Support Detachment
SWMU 6 Former NASD, Vieques Island, Puerto Rico

Chemical	Station ID	Sample Date	Result	Qualifer	Ecological Criteria [1]	Exceedances of ECO
	NDW06SD01	04/13/00	1930	=		na
	NDW06SD12	09/04/03	1540	=		na
	NDW06SD14	09/03/03	1330	=		na
	NDW06SD02	04/13/00	1290	J		na
	NDW06SD13	09/03/03	1220	=		na
	NDW06SD11	09/03/03	861	J		na
	NDW06SD02	09/03/03	857	J		na
	NDW06SD10	09/04/03	822	J		na
SELENIUM	NDW06SD02	04/13/00	544	=	NA	na
	NDW06SD03A	04/13/00	2.2	J		na
	NDW06SD07A	04/13/00	1.4	J		na
	NDW06SD05A	04/13/00	1.3	J		na
	NDW06SD05B	09/03/03	1.13	J		na
	NDW06SD08	09/04/03	1.06	J		na
	NDW06SD09	09/04/03	1.06	J		na
	NDW06SD07B	09/04/03	1.05	J		na
	NDW06SD04	04/13/00	0.96	J		na
	NDW06SD03B	09/03/03	0.802	J		na
	NDW06SD06A	04/13/00	0.8	J		na
	NDW06SD06B	09/04/03	0.794	J		na
	NDW06SD13	09/03/03	0.259	J		na
	NDW06SD11	09/03/03	0.252	J		na
SILVER	NDW06SD02	04/13/00	14.5	=	2	yes
	NDW06SD08	09/04/03	0.136	J		no
	NDW06SD05B	09/03/03	0.102	J		no
	NDW06SD13	09/03/03	0.0386	J		no
SODIUM	NDW06SD03A	04/13/00	45700	=	NA	na
	NDW06SD07A	04/13/00	41000	=		na
	NDW06SD05A	04/13/00	38600	=		na
	NDW06SD04	04/13/00	32200	=		na

Table I-2
Detected Chemicals in Sediment
SWMU 6, Naval Ammunition Support Detachment
SWMU 6 Former NASD, Vieques Island, Puerto Rico

Chemical	Station ID	Sample Date	Result	Qualifer	Ecological Criteria [1]	Exceedances of ECO
	NDW06SD08	09/04/03	29200	J		na
	NDW06SD07B	09/04/03	29100	J		na
	NDW06SD05B	09/03/03	26300	J		na
	NDW06SD09	09/04/03	21900	J		na
	NDW06SD03B	09/03/03	18500	J		na
	NDW06SD06B	09/04/03	18300	J		na
	NDW06SD01	04/13/00	11100	=		na
	NDW06SD06A	04/13/00	8900	=		na
	NDW06SD14	09/03/03	8900	=		na
	NDW06SD12	09/04/03	8820	=		na
	NDW06SD02	04/13/00	7190	=		na
	NDW06SD02	09/03/03	6640	=		na
	NDW06SD13	09/03/03	6520	=		na
	NDW06SD10	09/04/03	6020	=		na
	NDW06SD11	09/03/03	5710	=		na
THALLIUM	NDW06SD02	04/13/00	572	=	NA	na
	NDW06SD03A	04/13/00	1.4	J		na
	NDW06SD05B	09/03/03	1.01	J		na
	NDW06SD08	09/04/03	0.873	J		na
	NDW06SD09	09/04/03	0.586	J		na
VANADIUM	NDW06SD02	04/13/00	174	=	NA	na
	NDW06SD03A	04/13/00	50.9	=		na
	NDW06SD07B	09/04/03	47.8	J		na
	NDW06SD08	09/04/03	45.9	J		na
	NDW06SD07A	04/13/00	45.7	=		na
	NDW06SD05A	04/13/00	40.1	J		na
	NDW06SD04	04/13/00	35	J		na
	NDW06SD05B	09/03/03	34.3	J		na
	NDW06SD09	09/04/03	31	J		na
	NDW06SD01	04/13/00	30.5	=		na

Table I-2
Detected Chemicals in Sediment
SWMU 6, Naval Ammunition Support Detachment
SWMU 6 Former NASD, Vieques Island, Puerto Rico

Chemical	Station ID	Sample Date	Result	Qualifer	Ecological Criteria [1]	Exceedances of ECO
	NDW06SD06B	09/04/03	28.4	J		na
	NDW06SD06A	04/13/00	23.5	=		na
	NDW06SD03B	09/03/03	21.9	J		na
	NDW06SD13	09/03/03	14.7	=		na
	NDW06SD12	09/04/03	14.5	=		na
	NDW06SD10	09/04/03	11.4	=		na
	NDW06SD14	09/03/03	9.3	J		na
	NDW06SD11	09/03/03	8.77	J		na
	NDW06SD02	09/03/03	6.51	J		na
ZINC	NDW06SD10	09/04/03	241	=	124	yes
	NDW06SD02	04/13/00	173	=		yes
	NDW06SD03A	04/13/00	67.5	=		no
	NDW06SD05B	09/03/03	61.6	J		no
	NDW06SD04	04/13/00	60.5	=		no
	NDW06SD05A	04/13/00	59.2	=		no
	NDW06SD07A	04/13/00	53.2	=		no
	NDW06SD08	09/04/03	47.4	J		no
	NDW06SD07B	09/04/03	47	J		no
	NDW06SD09	09/04/03	41.5	J		no
	NDW06SD01	04/13/00	26.1	=		no
	NDW06SD06B	09/04/03	25.7	J		no
	NDW06SD12	09/04/03	21.1	=		no
	NDW06SD06A	04/13/00	12.9	=		no
Volatile Organic Compounds (mg/Kg)						
ACETONE	NDW06SD14	09/03/03	0.604	J	NA	na
	NDW06SD03B	09/03/03	0.315	J		na
	NDW06SD02	09/03/03	0.268	J		na
CARBON DISULFIDE	NDW06SD03A	04/13/00	0.022	J	NA	na
	NDW06SD07A	04/13/00	0.02	J		na
	NDW06SD05A	04/13/00	0.015	J		na

Table I-2
Detected Chemicals in Sediment
SWMU 6, Naval Ammunition Support Detachment
SWMU 6 Former NASD, Vieques Island, Puerto Rico

Chemical	Station ID	Sample Date	Result	Qualifer	Ecological Criteria [1]	Exceedances of ECO
	NDW06SD04	04/13/00	0.013	J		na
	NDW06SD06A	04/13/00	0.008	J		na
	NDW06SD05B	09/03/03	0.0048	J		na
	NDW06SD09	09/04/03	0.0044	J		na
	NDW06SD07B	09/04/03	0.0039	J		na
	NDW06SD01	04/13/00	0.003	J		na
	NDW06SD02	04/13/00	0.003	J		na
	NDW06SD03B	09/03/03	0.001	J		na
	NDW06SD11	09/03/03	0.0008	J		na
ETHYLBENZENE	NDW06SD05A	04/13/00	0.002	J	NA	na
	NDW06SD04	04/13/00	0.001	J		na
	NDW06SD07A	04/13/00	0.001	J		na
M,P-XYLENE (SUM OF ISOMERS)	NDW06SD03A	04/13/00	0.013	J	NA	na
	NDW06SD05A	04/13/00	0.01	J		na
	NDW06SD04	04/13/00	0.008	J		na
	NDW06SD07A	04/13/00	0.005	J		na
	NDW06SD01	04/13/00	0.0003	J		na
METHYL ETHYL KETONE (2-BUTANONE)	NDW06SD03A	04/13/00	0.017	J	NA	na
	NDW06SD05A	04/13/00	0.012	J		na
	NDW06SD07A	04/13/00	0.012	J		na
	NDW06SD01	04/13/00	0.004	J		na
	NDW06SD02	04/13/00	0.004	J		na
METHYLENE CHLORIDE	NDW06SD07B	09/04/03	0.0082	J	NA	na
	NDW06SD06B	09/04/03	0.0063	J		na
	NDW06SD09	09/04/03	0.005	J		na
	NDW06SD08	09/04/03	0.0039	J		na
	NDW06SD05B	09/03/03	0.0028	J		na
	NDW06SD12	09/04/03	0.002	J		na
	NDW06SD10	09/04/03	0.0013	J		na
	NDW06SD02	09/03/03	0.0012	J		na

Table I-2
Detected Chemicals in Sediment
SWMU 6, Naval Ammunition Support Detachment
SWMU 6 Former NASD, Vieques Island, Puerto Rico

Chemical	Station ID	Sample Date	Result	Qualifer	Ecological Criteria [1]	Exceedances of ECO
	NDW06SD03B	09/03/03	0.00099	J		na
	NDW06SD13	09/03/03	0.00094	J		na
	NDW06SD11	09/03/03	0.00086	J		na
	NDW06SD14	09/03/03	0.00077	J		na
O-XYLENE (1,2-DIMETHYLBENZENE)	NDW06SD03A	04/13/00	0.003	J	NA	na
	NDW06SD05A	04/13/00	0.003	J		na
	NDW06SD04	04/13/00	0.002	J		na
	NDW06SD07A	04/13/00	0.002	J		na
TOLUENE	NDW06SD03A	04/13/00	0.003	J	NA	na
	NDW06SD04	04/13/00	0.003	J		na
	NDW06SD05A	04/13/00	0.003	J		na
	NDW06SD07A	04/13/00	0.003	J		na
XYLENES, TOTAL	NDW06SD03A	04/13/00	0.016	J	0.04	no
	NDW06SD05A	04/13/00	0.013	J		no
	NDW06SD04	04/13/00	0.01	J		no
	NDW06SD07A	04/13/00	0.007	J		no
	NDW06SD01	04/13/00	0.0003	J		no
Semivolatile Organic Compounds (mg/Kg)						
ANTHRACENE	NDW06SD12	09/04/03	0.038	J	0.33	no
BENZO(a)ANTHRACENE	NDW06SD12	09/04/03	0.0646	J	0.33	no
BENZO(a)PYRENE	NDW06SD12	09/04/03	0.0797	J	0.33	no
BENZO(b)FLUORANTHENE	NDW06SD12	09/04/03	0.0916	J	0.33	no
BENZO(g,h,i)PERYLENE	NDW06SD10	09/04/03	0.0409	J	0.655	no
BENZO(k)FLUORANTHENE	NDW06SD12	09/04/03	0.0784	J	0.33	no
bis(2-ETHYLHEXYL) PHTHALATE	NDW06SD05B	09/03/03	0.446	J	0.182	yes
	NDW06SD03B	09/03/03	0.284	J		yes
	NDW06SD11	09/03/03	0.163	J		no
	NDW06SD02	09/03/03	0.16	J		no
	NDW06SD14	09/03/03	0.139	J		no
	NDW06SD13	09/03/03	0.119	J		no

Table I-2
Detected Chemicals in Sediment
SWMU 6, Naval Ammunition Support Detachment
SWMU 6 Former NASD, Vieques Island, Puerto Rico

Chemical	Station ID	Sample Date	Result	Qualifer	Ecological Criteria [1]	Exceedances of ECO
CHRYSENE	NDW06SD12	09/04/03	0.068	J	0.33	no
FLUORANTHENE	NDW06SD12	09/04/03	0.0363	J	0.33	no
PYRENE	NDW06SD12	09/04/03	0.0504	J	0.33	no
	NDW06SD11	09/03/03	0.0307	J		no
Pesticides (mg/Kg)						
p,p'-DDD	NDW06SD13	09/03/03	0.67	J	0.0033	yes
	NDW06SD12	09/04/03	0.0035	J		yes
	NDW06SD09	09/04/03	0.0024	J		no
	NDW06SD08	09/04/03	0.0023	J		no
	NDW06SD11	09/03/03	0.0012	J		no
	NDW06SD14	09/03/03	0.00026	J		no
p,p'-DDE	NDW06SD13	09/03/03	0.41	J	0.0033	yes
	NDW06SD10	09/04/03	0.0036	J		yes
	NDW06SD12	09/04/03	0.0036	J		yes
	NDW06SD11	09/03/03	0.0015	J		no
	NDW06SD02	04/13/00	0.00081	J		no
p,p'-DDT	NDW06SD05B	09/03/03	0.0086	J	0.0033	yes
	NDW06SD10	09/04/03	0.002	J		no
	NDW06SD14	09/03/03	0.00035	J		no

[1] The lower of the screening criteria for marine and estuarine sediments (Long, 1995) or the USEPA guidance on Ecological Risk Assessment (USEPA, 2000).

ND indicates that the chemical was not detected.

NA indicates that the information is not available or not applicable.

J indicates that the chemical was detected. The reported value is estimated.

= infdicates that the chemical was detected. The reported value is the measured concentration.

Vieques Former NASD SWMU 6 Data Quality Evaluation (DQE)

TO: Vijaya Mylavarapu/GNV

COPIES: Marty Clasen/TPA
Jim Edens/GNV

FROM: Kevin A. Sanders/GNV

DATE: January 28, 2004

Introduction

The purpose of the technical memorandum (TM) is to present the findings of the data quality evaluation (DQE) performed on the multi-media sampling collected as part of Former NASD SWMU 6 PASI and RIFS activities.

The purpose of the data quality evaluation process is to assess the effect of the overall analytical process on the usability of the data. The two major categories of data evaluation are laboratory performance and matrix interferences. Evaluation of laboratory performance is a check for compliance with the method requirements; either the laboratory did, or did not, analyze the samples within the limits of the analytical method. Evaluation of matrix interferences is more subtle and involves the analysis of several areas of results including surrogate spike recoveries, matrix spike recoveries, and duplicate sample results.

SWMU 6 samples were collected during the PASI from April 13th , 2000 through June 5th , 2000 and during the RIFS from August 28th through October 1st , 2003 . Field QC samples collected included field duplicates, field blanks, trip blanks (analyzed for VOCs only), and equipment rinsate blanks. The number of each type of sample is listed by analytical method in ***Exhibit 1***. The samples were analyzed for the following analytical fractions:

- Volatile organic compounds (VOCs) by SW-846 method 8260B
- Semivolatile organic compounds (SVOCs) by SW-846 method 8270C
- Organochlorine Pesticides and PCB's by SW846 method 8081A and 8082
- Explosives by SW846 method 8330
- Perchlorates by EPA 314.0 and 314.0M, Ion Chromatography
- Metals by SW-846 method 6010B (ICPES)
- Mercury by SW-846 method 7470A and 7471A
- General Chemistry Parameters: Sulfate, Phosphorus, Nitrite, Nitrate-nitrite, Chloride, and Alkalinity

Before the analytical results were released by the laboratory, both the sample results and associated QC data were carefully reviewed to verify sample identity, instrument calibration, detection limits, dilution factors, numerical computations, accuracy of transcriptions, and chemical interpretations. Additionally, the QC data were reduced and the resulting data were reviewed to ascertain whether

they were within the laboratory-defined limits for accuracy and precision. Data non-conformances were discussed in the data package cover letter and case narrative

The hardcopy data packages were reviewed by the sub-contractor (EDS) utilizing review criteria as specified by the EPA Region II guidelines, basically following that outlined in the Environmental Protection Agency (EPA) guidance document *Contract Laboratory Program National Functional Guidelines for Organic (1999) and Inorganic Data Review (2002) [NFG].*). Areas of review included (when applicable to the method) holding time compliance, calibration verification, blank results, matrix spike precision and accuracy, method accuracy as demonstrated by LCSs, field duplicate results, surrogate recoveries, internal standard performance, and interference checks. A data review worksheet was completed for each of these data packages and any non-conformance documented. This data review and validation process is independent of the laboratory's checks and focuses on the usability of the data to support the project data interpretation and decision-making processes.

Data that were not within the acceptance limits were appended with a qualifying flag, which consists of a single or double-letter abbreviation that reflects a problem with the data. Although the qualifying flags are appended to data records during the database query process, they are also included in the final data summary tables deliverable so that the data will not be used indiscriminately. These also include secondary, or the two-digit "sub-qualifier" flags, which are entered into the comment field of the database. ***Exhibit 2*** presents these codes and their definitions. The following primary flags were used to qualify the data:

- **U** - Undetected. Analyte was analyzed for but not detected above the method detection limit.
- **UJ** - Detection limit estimated. Analyte was analyzed for, and qualified as not detected. The result is estimated.
- **J** - Estimated. The analyte was present, but the reported value may not be accurate or precise.
- **R** - Rejected. The data are unusable. (NOTE: Analyte/compound may or may not be present.)

Numerical sample results that are greater than the method detection limit (MDL) but less than the laboratory reporting limit (RL) are qualified with a "J" for estimated as required by NFG.

The entire database was queried for frequency of detection in blanks and samples, detailed listing of blank detects, matrix spike/matrix spike duplicate (MS/MSD) results, field duplicate precision, surrogate recoveries, preparation and analysis dates pertaining to holding times. The queries were then manipulated to calculate necessary statistics for evaluation of the data.

Once the data review and validation process was completed, the entire data set were reviewed for analyte frequencies of detection, dilution factors that might affect data usability, and patterns of target analyte distribution. The data set was also evaluated to identify potential data limitations, uncertainties, or both in the analytical results. ***Exhibit 3*** presents data which were rejected.

Holding Times

The holding times for each parameter were evaluated according to SW-846 requirements. Nine nitrate-nitrogen, 9 nitrite nitrogen, and 3 orthophosphorus records were estimated for missed holding times (less than 1 day outside established criteria). All other sample analyses met holding time

criteria. NOTE: The 3rd party validation erroneously flagged 1400 PASI (year 2000) organic records (378 8081A, 126 8082, and 896 8270C) as "J/UJ" (estimated) for holding times. The analyses were, in fact, within holding times; however, as 3rd party validation is required, the database flags were not changed. (See August 2000 memo)

Calibration

Most all calibration criteria pertaining to all methods were met for these samples. One-hundred and eighty-nine results were qualified as estimated (J/UJ). These estimated records included 84 pesticides, 52 volatiles, 45 semivolatiles, and 8 explosives. Sixty-eight records were rejected for low relative response factors (RRF). These results included twenty-seven 2-butanone and 41 acetone records. Acetone and 2-butanone are noted poor performers by method 8260B and are not contaminants of concern at the SWMU. Additionally, 23 organochlorine pesticide results were estimated (J/UJ) due to second column confirmation percent difference (%D) outside established criteria.

Laboratory Method Accuracy

Laboratory control samples (LCS's) or blank spikes are quality control samples utilized to monitor laboratory method performance. This sample does not possess a difficult matrix as it consists of deionized (DI) laboratory water spiked with the target compounds of interest. With few exceptions, LCS data was within method criteria indicating that the laboratory method was in control.

Exhibit 4 indicates that a total of 188 total records (out of 3677 total or 5.1%) for individual compounds in select samples were qualified due to LCS recoveries outside control limits. Thirty-one of these records were estimated (UJ) for the explosives compound N-Methyl-N,2,4,6-Tetranitroaniline. Forty-eight and four records were estimated (J/UJ) for orhanochlorine pesticides and semi-volatiles, respectively.

The rejected records (105) consisted of 76 semi-volatiles and 29 volatiles. All other LCS accuracy and precision criteria were met. These method accuracy and precision data indicate that the laboratory analytical methods were in control.

Potential Field Sampling and Laboratory Contamination

Four types of blank samples were used to monitor potential contamination introduced during field sampling, sample handling, shipping activities, as well as sample preparation and analysis in the laboratory. Types of blank samples included:

- **Trip Blank (TB)**: A sample of analyte free water that is prepared in the laboratory prior to the sampling event. The water is stored in VOC sample containers and is not opened in the field, and travels back to the laboratory with the other samples for VOC analysis. This blank is used to monitor the potential for sample contamination during the sample container trip. One trip blank was included in each sample cooler that contained samples for VOC analysis. Eleven trip blanks were submitted to the laboratory with these samples.

- **Equipment Rinsate Blank (ERB)**: A sample of the target-free water used for the final rinse during the equipment decontamination process. This blank sample is collected by rinsing the sampling equipment after decontamination and is analyzed for the same analytical parameters as the corresponding samples. This blank is used to monitor potential contamination caused by incomplete equipment decontamination. One equipment rinsate blank should be collected per day of sampling, per type of sampling equipment. Depending on the method, up to twelve equipment rinsate blanks were submitted to the laboratory for this field effort

- **Field Blank or Ambient Blank (FB or AB)**: The field blank is an aliquot of the source water used for equipment decontamination. This blank monitors contamination that may be introduced from the water used for decontamination. One field blank should be collected from each source of decontamination water and analyzed for the same parameters as the associated samples. Up to 5 field blanks were collected during this sampling event, depending on the method.

- **Laboratory Method Blank or Method Blank (MB)**: A laboratory method blank is ASTM Type II water that is treated as a sample in that it undergoes the same analytical process as the corresponding field samples. Method blanks are used to monitor laboratory performance and contamination introduced during the analytical procedure. One method blank was prepared and analyzed for every twenty samples or per analytical batch, whichever was more frequent.

According to the NFG, concentrations of common organic contaminants detected in samples at less than ten times the concentration of the associated blanks can be attributed to field sampling and laboratory contamination rather than environmental contamination from site activities. Common organic contaminants include acetone, methylene chloride, 2-butanone, and the phthalates. For other inorganic and organic contaminants, five times the concentration detected in the associated blanks (rather than ten times) is used to qualify results as potential field and/or laboratory contamination rather than environmental contamination. The ten times rule was applied on an sample delivery group (SDG) by SDG basis and not globally. Global flag application, however, would account for anomalous data which should also be attributed to laboratory or field blank contamination.

Field sample concentrations less than the action levels (5 or 10 times rule) were qualified as not detected (72 total records).

As presented in ***Exhibit 4,*** five volatile compound contaminants detected in blanks resulted in qualification of field samples. Acetone and methylene chloride were detected in all blank types, resulting in 18 and 3 records qualified as non-detect due to blank contamination, respectively. Acetone and methylene chloride are extraction solvents and are common laboratory contaminants. Total xylene, m,p-xylene, and toluene were detected at mostly sub-part-per-billion levels in all blank types. Five each records of total xylene and m,p-xylene were qualified as non-detect. Blank contamination resulted in 12 toluene records qualified as non-detect.

Phthalates are plasticizers and common contaminants. The most common phthalates are bis(2-ethylhexyl) phthalate (BEHP), Di-n-butylphthalate, and Diethyl phthalate. Phthalates are often introduced into samples during handling. Gloves are often used when handling sampling equipment such as pumps, hoses, split spoons, dredges and bailers. Additionally, laboratory chemists use gloves when handling samples and extracts. Gloves are coated with plasticizers such as BEHP to facilitate release of the gloves from the skin. Three phthalate compounds were reported in ambient, equipment, and laboratory blanks. These compounds were bis(2-ethylhexyl) phthalate (BEHP), diethyl phthalate, and di-n-butyl phthalate. Four diethyl phthalate records, 24 BEHP records, and a single Di-n-butyl phthalate record were qualified as non-detect due to blank contamination.

Matrix Effects

Surrogate Spike Recovery

Surrogate spike compounds were added to every sample analyzed for the organic parameters including field and laboratory blanks as well as field environmental samples. Surrogate spikes consist of organic compounds which are similar to the method targets in chemical composition and behavior in the analytical process, but which are not normally found in environmental samples.

Surrogate spike recoveries were used to monitor both laboratory performance and matrix interferences. Surrogate spike recoveries from field and laboratory blanks were used to evaluate

laboratory performance because the blanks should represent an "ideal" sample matrix. Surrogate spike recoveries for field samples were used to evaluate the potential for matrix interferences. According to *NFG*, data are not qualified with respect to surrogate recoveries unless one or more volatile surrogates are out of specifications. Semivolatiles are not qualified unless two or more surrogates, within the same fraction (base/neutral or acid fraction), are out of specification.

Exhibit 4, "Change in Qualifiers", indicates that 646 records (of 17,239 or 3.7 %) were qualified due to surrogate recoveries outside control limits. All but 93 (0.5 % of the total) of these records were estimated (J/UJ). A single explosives sample (NDA104FD1) realized 12 records rejected due to surrogate recoveries less than 10%. Organochlorine pesticide records rejected for low surrogate recoveries (<10%) numbered 81. Samples NDW06FD03P-R01, NDW06GW05-R01, NDW06SD07-R01, and NDW06SD14-R01 had 20, 21, 21, and 19 records, respectively, rejected.

Overall, surrogate recoveries were well within criteria indicating that the specific sample matrix did not greatly influence the overall analytical process or the final numerical sample result.

Matrix Spike/Matrix Spike Duplicate Precision and Accuracy

A matrix spike is an aliquot of sample spiked with a known concentration of target analyte(s). The spiking occurs prior to sample preparation and analysis. A matrix spike is used to document the bias of a method in a given sample matrix. The matrix spike duplicate is an intra-laboratory-split sample spiked with identical concentrations of target analyte(s). The spiking occurs prior to sample preparation and analysis. They are used to document the precision and accuracy of a method in a given sample matrix. For the MS/MSD measurement, three aliquots of a single sample are analyzed; one native sample and two spiked with target analytes or compounds. Matrix accuracy is evaluated from the spike recoveries, while matrix precision is evaluated from comparison of the found concentrations of the MS and MSD.

Organic results are not qualified upon the results of MS/MSD results alone. Evaluation is in conjunction with surrogate, LCS, and internal standard (if applicable) results. Additionally, many MS/MSD samples require dilution and thus the spike compounds added are diluted out and unable to be evaluated.

Inorganic results may be qualified solely upon the results of the matrix spike/matrix spike duplicate precision and accuracy. Instances where the native sample concentration for a given element exceeds the spike added concentration by a factor of four or more are not evaluated as the spike added would be masked by the native concentration. According to NFG, metals recoveries of greater than 30% and less than 75% recovery are required to be flagged as estimated (J/UJ). Recoveries greater than 125% requires that detections be estimated (J) and non-detects remaining as undetected. Precision requirements for waters and soils are set at 20 and 35 relative percent difference (RPD), respectively. ***Exhibit 4*** indicates that 131 records (0.8 %of the total) were qualified due to MS or MSD recoveries outside control limits. Of these records, 119 were estimated (J/UJ) and 12 non-detects were rejected. Five dissolved iron in groundwater and 7 mercury records in surface water were rejected. The majority of the accuracy and precision results were well within established criteria, indicating that the specific sample matrix did not greatly influence the overall analytical process or the final numerical sample result.

Serial Dilutions for ICPES

Serial dilutions are performed on samples being quantitated by Inductively Coupled Plasma Emission Spectroscopy (ICPES) in order to aid in the recognition of matrix interferences (spectral overlap, background light and noise, and physical). A field sample with concentrations (ideally) greater than 50 times the instrument detection limit (IDL) are diluted 1+4 (5-fold) and analyzed immediately after

the straight native digestate. The qualifying concentrations of the dilution are then multiplied by five and compared to the concentrations of the native sample. A percent difference (%D) is calculated from this comparison and %D's greater than 10% result in associated samples in that analytical batch to be qualified as estimated (J/UJ) for that particular element.

Serial Dilution records estimated due %D's greater than 10% numbered 175 (6.8% of all ICPES records). Table 1 lists the element and the associated number of records estimated for the serial dilution statistic.

Table 1 – Results estimated due to Serial Dilutions Outside Criteria by Element and Associated Number of Records

Element	Ba	Ca	Co	Fe	Mg	Mn	Ni	K	Na
Number of Records	3	31	8	12	26	8	16	47	24

This statistic indicates that the specific sample matrix did not greatly influence the overall analytical process or the final numerical sample result.

Laboratory Duplicate Precision

A laboratory duplicate is an intralaboratory split of a native field sample which is analyzed for the same parameters. Precision is determined from the concentrations of the native and the split duplicate. Two each surface soil and soil boring records were estimated for calcium with the RPD statistic greater than 35%. These data indicate that the matrix did not have an influence on the final numerical result.

Field Duplicate Sample Results

Field duplicate analyses measure both field and laboratory precision and can also be affected by the homogeneity of the samples.

Depending on the method, up to two sets of field duplicates were collected during this field effort. Both the native and duplicate samples were analyzed for the same parameters.

An aqueous control limit of ± 20% for the RPD was used for original and duplicate sample values greater than or equal to five times the RL. Solid samples utilized a control limit of 35 RPD. A control limit of ± the RL was used if either the sample for the duplicate value was less than five times the RL for waters and 2 times the RL for soils. In the cases where only one result is above the five times the RL level and the other is below, the ± RL criteria were applied.

There were 180 result sets which were measurable. Sixteen records (14 metals and pesticide) were qualified as estimated (J). These statistics indicate that matrix heterogeneity and sampling technique did not greatly influence the final numerical result.

Total versus Dissolved Metals and Anions

Aqueous samples were split and a one aliquot per sample field filtered. A comparison between the total and dissolved results was performed in order to establish whether the major anion or cation were associated with the dissolved or total fraction. Results where the total and dissolved concentrations were greater than five times the reporting limit were evaluated as is; that is whether the dissolved fraction was greater than the total. In the instance where one or both concentrations were less than five times the RL, the difference between the two values were compared to the RL. If the difference was less than the RL, the comparison was not performed as the difference would be considered within analytical method error. There were 441 "measurable" sets of data. Eleven sets (2.5 %) were outside

the above outlined criteria. There were no results qualified for the dissolved versus total measurement.

Sample Results Quantitated at or Near the Method Detection Limit (MDL)

The MDL is defined as the minimum concentration of an analyte that can be identified, measured, and reported with 99% confidence that the analyte concentration is greater than zero. Sample results at, or near the MDL are not accurate or precise. This situation is often caused by instrument noise or low-level background shifts rather than a true analyte signal. Concentrations at this level may be Type I (alpha) errors (or false positives) and should be applied in this manner. As concentrations approach a "quantitation limit", the confidence in the values increase.

PARCCs

Precision--is defined as the agreement between duplicate results, and was estimated by comparing duplicate matrix spike recoveries, and field duplicate sample results. MS/MSD precision was documented as well within control limit criteria for most samples and targets. Other than the documented exceptions, the precision between native and field duplicate sample results were within acceptable criteria for the majority of the measurements indicating that sample matrix did not significantly interfere with the overall analytical process.

Accuracy--is a measure of the agreement between an experimental determination and the true value of the parameter being measured. For the organic analyses, each of the samples was spiked with a surrogate compound; and for organic and inorganic analyses a MS/ MSD, and LCS were spiked with a known reference material before preparation. The surrogate and MS/MSD data provides a measure of the matrix effects as they may effect accuracy and precision on the analytical method. The LCS results demonstrate accuracy of the method. Spike recoveries were within the method acceptance limits for the majority of the measurements; therefore, other than the documented exceptions, there was no evidence of significant matrix interferences that would affect the usability of the data.

Representativeness--this criteria is a qualitative measure of the degree to which sample data accurately and precisely represent a characteristic environmental condition. Representativeness is a subjective parameter and is used to evaluate the efficacy of the sampling plan design. Representativeness was demonstrated by providing full descriptions in the project scoping documents of the sampling techniques and the rationale used for selecting sampling locations.

Completeness--is defined as the percentage of measurements that are judged to be valid compared to the to total number of measurements made. A goal of 90 percent usable data was established in the project scoping document. The completeness for this sampling event was calculated to be **98.5** percent (17069/17335).

Comparability--is another qualitative measure designed to express the confidence with which one data set may be compared to another. Factors that affect comparability are sample collection and handling techniques, sample matrix type, and analytical method. Comparability is limited by the other PARCC parameters because data sets can be compared with confidence only when precision and accuracy are known. Data from this investigation are comparable with other data collected at the site because only EPA methods were used to analyze the sample and EPA Level IV QC data are available to support the quality of the data.

Summary and Conclusions

Conclusions of the data quality evaluation process include:

- The laboratory analyzed the samples according to the EPA methods stated in the work plan as demonstrated by the deliverable summaries and analytical run sequences
- Sample results for metals above the MDL but less than the RL may be attributed to instrument noise and/or low level contamination and not site-related activities and as such may be false positives
- Sample results for target organic compounds above the MDL but less than the RL should be considered as uncertain but indicative of the presence of that compound at an estimated concentration
- Sixty-eight volatile were rejected for low relative response factors
- Low recoveries of the LCS resulted in 105 non-detect records being rejected
- Eighty-one records were rejected due to surrogate recoveries less than 10%
- Twelve records were rejected for poor MS/MSD recoveries
- Spike recoveries, surrogates, and field duplicate sample results (other than the exceptions documented in the text and attachments) indicate that the specific sample matrix did not significantly interfere with the analytical process or the final numerical result

The project objectives or PARCCs were met, and the data can be used in the project decision-making process as qualified by the data quality evaluation process.

Vieques 4 RIFS

CH2M HILL

Chain of Custody Form

2308-162 CH

Project Site	SWMU 6
Project Manager	Marty Clasen
Contact Tel No.	813-874-6522
Contact Address	4350 W. Cypress Street, Suite 600, Tampa, FL 33607
Lab Name	PEL Laboratories, Inc.
Lab Contact	Eric Battista
Lab Address	4420 Pendola Point Rd. Tampa, FL 33619

Item	Sample ID	Station ID	Matrix	Date & Time Collected	Number of Containers	CMET_SD	CPEST_SD,CPCB_SD	CSVOL_SD,EXP_SD	CVOL_SD	PERC_SD	CMET_W	CPEST_W,CPCB_W	CSVOL_W	CVOL_W	EXP_W	PERC_W	Comments
1	NDW06SD02-R01	NDW06SD02	SD	9-3-03 12:45	6	X	X	X	X	X							01
2	NDW06SD03-R01	NDW06SD03	SD	9-3-03 11:40	6	X	X	X	X	X							02
3	NDW06SD05-R01	NDW06SD05	SD	9-3-03 11:15	6	X	X	X	X	X							03
4	NDW06SD06-R01	NDW06SD06	SD		6	X	X	X	X	X							
5	NDW06SD07-R01	NDW06SD07	SD		6	X	X	X	X	X							
6	NDW06SD08-R01	NDW06SD08	SD		12	X	X	X	X	X							
7	NDW06SD09-R01	NDW06SD09	SD		6	X	X	X	X	X							
8	NDW06SD10-R01	NDW06SD10	SD		6	X	X	X	X	X							
9	NDW06SD11-R01	NDW06SD11	SD	9-3-03 1:45	6	X	X	X	X	X							04
10	NDW06SD12-R01	NDW06SD12	SD		6	X	X	X	X	X							
11	NDW06SD13-R01	NDW06SD13	SD	9-3-03 1:30	8	X	X	X	X	X							05

Project No. 171119

Lab Batch/SDG ID

Lab Tel No./Fax No. 813-247-2805 / 813-248-1537

Use Extra Samples for MS/MSD (possible matrix interference)

MARINE Sediments

Sampled By: Rich Gonzon Date/Time: 9/3/03 1430

Custody Seal: (Y) / N Relinquished By: Richard Gonzon Date/Time: 9/03/03 1500

Shipped Via: UPS (FedEx) Hand Other (Please specify):

Samples Temperature and Condition Upon Receipt (for lab's use): TEMP @ ARRIVAL 2.8, 2.8C pH. <2

Received By: Melon Maxmodie Date/Time: 9/4/03 10:15 Custody Seal: Y / N Relinquished By: Date/Time:

Received By: Date/Time: Custody Seal: Y / N Relinquished By: Date/Time:

Remarks: ENCORES REC'D

CMET_W & PERC_W NOT REC'D FOR SAMPLE 08.

Vieques 4 RIFS

CH2M HILL

Chain of Custody Form

2308-162 cm

Project Site	SWMU 6				Number of Containers	Analysis Requested												Project No. 171119
Project Manager	Marty Clasen																	Lab Batch/SDG ID
Contact Tel No.	813-874-6522																	
Contact Address	4350 W. Cypress Street, Suite 600, Tampa, FL 33607																	Lab Tel No./Fax No.
Lab Name	PEL Laboratories, Inc.																	813-247-2805 / 813-248-1537
Lab Contact	Eric Battista																	
Lab Address	4420 Pendola Point Rd. Tampa, FL 33619																	
Item	Sample ID	Station ID	Matrix	Date & Time Collected		CMET_SD	CPEST_SD,CPCB_SD	CSVOL_SD,EXP_SD	CVOL_SD	PERC_SD	CMET_W	CPEST_W,CPCB_W	CSVOL_W	CVOL_W	EXP_W	PERC_W		Comments
1	NDW06SD14-R01	NDW06SD14	SD	9-3-03 12:30	5	X	X	X	X	X								06
~~6~~	~~NDW06SD15-R01~~	~~NDW06SD15~~	~~SD~~		~~5~~	~~X~~	~~X~~	~~X~~	~~X~~	~~X~~								MARINE
~~7~~	~~NDW06SD16-R01~~	~~NDW06SD16~~	~~SD~~		~~5~~	~~X~~	~~X~~	~~X~~	~~X~~	~~X~~								Sediments.
4	NDW06FD03P-R01	NDW06SD02	SD	9-3-03 12:45	6	X	X	X	X	X								07
5	NDW06SDAB01-03	FIELDQC	WQ	9/3/03 7:15	8						X	X	X	X	X	X		08 Possible
6	NDW06SDEB01-03	FIELDQC	WQ	11 7:45	8						X	X	X	X	X	X		09 Matrix
~~7~~	~~NDW06SDEB02-03~~	~~FIELDQC~~	~~WQ~~		~~8~~						~~X~~	~~X~~	~~X~~	~~X~~	~~X~~	~~X~~		Interference -
8	NDW06SDTB01-03	FIELDQC	WQ		3									X				10
~~9~~	~~NDW06SDTB02-03~~	~~FIELDQC~~	~~WQ~~		~~3~~									~~X~~				
10																		
11																		

Sampled By: Rick GORSIRA Date/Time: 9/3/03 1430 Custody Seal: (Y) N Relinquished By: [signature] Date/Time: 9/3/03 1500

Shipped Via: UPS (FedEx) Hand Other (Please specify):

Samples Temperature and Condition Upon Receipt (for lab's use): TEMP @ ARRIVAL 2.8, 2.8C

Received By: [signature]	Date/Time: 9/4/03 10:15	Custody Seal: Y / N Relinquished By:	Date/Time:
Received By:	Date/Time:	Custody Seal: Y / N Relinquished By:	Date/Time:

Remarks: ENCORES REC'D
CMET_SDW + PERC_W NOT REC'D FOR SAMPLE 08.

Vieques 4 RIFS

CH2M HILL

Chain of Custody Form 2308-123CM

Project Site		SWMU 6				Analysis Requested												Project No. 171119
Project Manager		Marty Clasen																Lab Batch/SDG ID
Contact Tel No.		813-874-6522																
Contact Address		4350 W. Cypress Street, Suite 600, Tampa, FL 33607																Lab Tel No./Fax No.
Lab Name		PEL Laboratories, Inc.																813-247-2805 / 813-248-1537
Lab Contact		Eric Battista																
Lab Address		4420 Pendola Point Rd. Tampa, FL 33619																
Item	Sample ID	Station ID	Matrix	Date & Time Collected	Number of Containers	CMET_SO	CPEST_SO,CPCB_SO	CSVOL_SO, EXP_SO	CVOL_SO	PERC_SO	CMET_W	CPEST_W,CPCB_W	CSVOL_W	CVOL_W	EXP_W	PERC_W		Comments
~~1~~	~~NDW06SB20-R01~~	~~NDW06SB20~~	~~SB~~		~~6~~	~~X~~	~~X~~	~~X~~	~~X~~	~~X~~								
~~2~~	~~NDW06SB21-R01~~	~~NDW06SB21~~	~~SB~~		~~6~~	~~X~~	~~X~~	~~X~~	~~X~~	~~X~~								
~~3~~	~~NDW06SB22-R01~~	~~NDW06SB22~~	~~SB~~		~~6~~	~~X~~	~~X~~	~~X~~	~~X~~	~~X~~								
~~4~~	~~NDW06SB23-R01~~	~~NDW06SB23~~	~~SB~~		~~18~~	~~X~~	~~X~~	~~X~~	~~X~~	~~X~~								Use Extra Samples for MS/MSD
5	NDW06SS09-R01	NDW06SS09	SS	8/28/03 @ 8:45	6	X	X	X	X	X								01
6	NDW06SS10-R01	NDW06SS10	SS	@ 8:45	6	X	X	X	X	X								02
7	NDW06SS11-R01	NDW06SS11	SS	@ 8:53	6	X	X	X	X	X								03
8	NDW06SS12-R01	NDW06SS12	SS	@ 9:15	6	X	X	X	X	X								04
9	NDW06SS13-R01	NDW06SS13	SS	@ 9:30	6	X	X	X	X	X								05
10	NDW06SS14-R01	NDW06SS14	SS	@ 9:30	6	X	X	X	X	X								06
11	NDW06SS15-R01	NDW06SS15	SS	@ 9:45	6	X	X	X	X	X								07

Sampled By: Rick Gorsira   Date/Time: 8/28/03 8:45   Custody Seal: (Y) N   Relinquished By: Rick Gorsira   Date/Time: 8/28/03, 3:00

Shipped Via: UPS   (FedEx)   Hand   Other (Please specify):

Samples Temperature and Condition Upon Receipt (for lab's use): TEMP ON ARRIVAL 1.2, 2.8, 2.8C   p.H<2 (8260, LCD)

Received By: [signature]   Date/Time: 8/29/03 10:00   Custody Seal: Y / N   Relinquished By: Date/Time:

Received By: Date/Time: Custody Seal: Y / N   Relinquished By: Date/Time:

Remarks: possible matrix interference due to high salinity
• ENCORES REC'D

Vieques 4 RIFS

CH2M HILL

Chain of Custody Form 2308.123cn

Project Site	SWMU 6															Project No. 171119
Project Manager	Marty Clasen				Number of Containers	Analysis Requested										Lab Batch/SDG ID
Contact Tel No.	813-874-6522															
Contact Address	4350 W. Cypress Street, Suite 600, Tampa, FL 33607															Lab Tel No./Fax No.
Lab Name	PEL Laboratories, Inc.															813-247-2805 / 813-248-1537
Lab Contact	Eric Battista															
Lab Address	4420 Pendola Point Rd. Tampa, FL 33619															
Item	Sample ID	Station ID	Matrix	Date & Time Collected		CMET_SO	CPEST_SO, CPCB_SO	CSVOL_SO, EXP_SO	CVOL_SO	PERC_SO	CMET_W	CPEST_W,CPCB_W	CSVOL_W	CVOL_W	EXP_W	PERC_W	Comments
1	NDW06SS16-R01	NDW06SS16	SS	8/28/03 @ 9:55	6	X	X	X	X	X							08
2	NDW06SS17-R01	NDW06SS17	SS	8/28/03 @ 10:10	6	X	X	X	X	X							09
3	NDW06SS18-R01	NDW06SS18	SS	8/28/03 @ 10:15	6	X	X	X	X	X							10
4	NDW06SS19-R01	NDW06SS19	SS	8/28/03 @ 10:25	6	X	X	X	X	X							11
5	NDW06SS20-R01	NDW06SS20	SS	8/28/03 @ 10:30	6	X	X	X	X	X							12
6	NDW06SS21-R01	NDW06SS21	SS	8/28/03 @ 10:45	6	X	X	X	X	X							13
7	NDW06SS22-R01	NDW06SS22	SS	8/28/03 @ 10:35	6	X	X	X	X	X							14
8	NDW06SS23-R01	NDW06SS23	SS	8/28/03 @ 10:50	18	X	X	X	X	X							Use Extra Samples for MS/MSD 15,16,17
9	NDW06FD04P-R01	NDW06SS09	SS	8/28/03 @ 845	6	X	X	X	X	X							18
~~10~~	~~NDW06FD[illegible]-R01~~	~~NDW06SB09~~	~~SB~~		~~6~~	~~X~~	~~X~~	~~X~~	~~X~~	~~X~~							
~~11~~	~~NDW06FD[illegible]-R01~~	~~NDW06SB[illegible]~~	~~SB~~		~~6~~	~~X~~	~~X~~	~~X~~	~~X~~	~~X~~							

Sampled By: Rick Gorsira	Date/Time: 8/28/03 9:55	Custody Seal: (Y) N Relinquished By: Rick Gorsira	Date/Time: 8/28/03 3:0
Shipped Via: UPS (FedEx) Hand	Other (Please specify):		
Samples Temperature and Condition Upon Receipt (for lab's use): TEMP ON ARRIVAL 1.2, 2.8, 2.8C P.H <2			
Received By: [signature]	Date/Time: 8/29/03 1000	Custody Seal: Y / N Relinquished By:	Date/Time:
Received By:	Date/Time:	Custody Seal: Y / N Relinquished By:	Date/Time:

Remarks: Possible Matrix Interference Due to high salinity
• ENCORES REC'D

Vieques 4 RIFS

CH2M HILL

Chain of Custody Form 2308-123cm

Project Site	SWMU 6
Project Manager	Marty Clasen
Contact Tel No.	813-874-6522
Contact Address	4350 W. Cypress Street, Suite 600, Tampa, FL 33607
Lab Name	PEL Laboratories, Inc.
Lab Contact	Eric Battista
Lab Address	4420 Pendola Point Rd. Tampa, FL 33619
Project No.	171119
Lab Batch/SDG ID	
Lab Tel No./Fax No.	813-247-2805 / 813-248-1537

Analysis Requested

Item	Sample ID	Station ID	Matrix	Date & Time Collected	Number of Containers	CMET_SO	CPEST_SO,CPCB_SO	CSVOL_SO, EXP_SO	CVOL_SO	PERC_SO	CMET_W	CPEST_W,CPCB_W	CSVOL_W	CVOL_W	EXP_W	PERC_W		Comments
1	NDW06SSAB01-03	FIELDQC	WQ	8/28/03@0650	8						X	X	X	X	X	X		19
2	NDW06SSEB01-03	FIELDQC	WQ	0700	8						X	X	X	X	X	X		20
3	[illegible]	FIELDQC	WQ		[illegible]						X	X	X	X	X	X		
4	NDW06SSTB01-03	FIELDQC	WQ	↓	3									X				21
5	[illegible]	FIELDQC	[illegible]		[illegible]									X				
6																		
7																		
8																		
9																		
10																		
11																		

Sampled By: Rick Gonsira Date/Time: 8/28/03 6:30 am Custody Seal: (Y)/N Relinquished By: Rick Gonsira Date/Time: 8/28/03 5:00

Shipped Via: UPS (FedEx) Hand Other (Please specify):

Samples Temperature and Condition Upon Receipt (for lab's use): TEMP ON ARRIVAL 1.2, 2.8, 2.8C P.H < 2

Received By: [signature] Date/Time: 8/29/03 Custody Seal: Y / N Relinquished By: Date/Time:

Received By: Date/Time: Custody Seal: Y / N Relinquished By: Date/Time:

Remarks:

Vieques 4 RIFS

CH2M HILL

Chain of Custody Form

2308-123cm

Project Site	SWMU 6
Project Manager	Marty Clasen
Contact Tel No.	813-874-6522
Contact Address	4350 W. Cypress Street, Suite 600, Tampa, FL 33607
Lab Name	PEL Laboratories, Inc.
Lab Contact	Eric Battiste
Lab Address	4420 Pendola Point Rd. Tampa, FL 33619

Project No.	171119
Lab Batch/SDG ID	
Lab Tel No./Fax No.	813-247-[illegible]805 / 813-248-1537

Item	Sample ID	Station ID	Matrix	Date & Time Collected	Number of Containers	CMET_SO	CPEST_SO,CPCB_SO	CSVOL_SO, EXP_SO	CVOL_SO	PERC_SO	CMET_W	CPEST_W,CPCB_W	CSVOL_W	CVOL_W	EXP_W	PERC_W	Comments
1	NDW06SB09-R01	NDW06SB09	SB		6	X	X	X	X	X							
2	NDW06SB10-R01	NDW06SB10	SB		6	X	X	X	X	X							
3	NDW06SB11-R01	NDW06SB11	SB		6	X	X	X	X	X							
4	NDW06SB12-R01	NDW06SB12	SB		6	X	X	X	X	X							
5	NDW06SB13-R01	NDW06SB13	SB		6	X	X	X	X	X							
6	NDW06SB14-R01	NDW06SB14	SB		6	X	X	X	X	X							
7	NDW06SB15-R01	NDW06SB15	SB		6	X	X	X	X	X							
8	NDW06SB16-R01	NDW06SB16	SB		6	X	X	X	X	X							
9	NDW06SB17-R01	NDW06SB17	SB		6	X	X	X	X	X							
10	NDW06SB18-R01	NDW06SB18	SB		6	X	X	X	X	X							
11	NDW06SB19-R01	NDW06SB19	SB		6	X	X	X	X	X							

Sampled By: Date/Time: Custody Seal: Y / N Relinquished By: Date/Time:

Shipped Via: UPS FedEx Hand Other (Please specify):

Samples Temperature and Condition Upon Receipt (for lab's use):

Received By: Date/Time: Custody Seal: Y / N Relinquished By: Date/Time:

Received By: Date/Time: Custody Seal: Y / N Relinquished By: Date/Time:

Remarks:

Vieques 4 RIFS

CH2M HILL

Chain of Custody Form 2308-205cm

Project Site	SWMU 6
Project Manager	Marty Clasen
Contact Tel No.	813-874-6522
Contact Address	4350 W. Cypress Street, Suite 600, Tampa, FL 33607
Lab Name	PEL Laboratories, Inc.
Lab Contact	Eric Battista
Lab Address	4420 Pendola Point Rd. Tampa, FL 33619

Project No. 171119

Lab Batch/SDG ID

Lab Tel No./Fax No.

813-247-2805 / 813-248-1537

Item	Sample ID	Station ID	Matrix	Date & Time Collected	Number of Containers	Analysis Requested: ALK_W	CL_W, SO4_W, NO3_W, NO2_W, OPO4_W	CMET_W	CPEST_W_L, CPCB_W_L	CSVOL_W_L	CVOL_W_L	DISSMET_W	EXP_W	PERC_W	Comments
1	NDW06GW01-R01	NDW06MW01	WG	9-5-03 10:05	11	X	X	X	X	X	X	X	X	X	01
2	NDW06GW02-R01	NDW06MW02	WG	9-5-03 12:00	11	X	X	X	X	X	X	X	X	X	02
3	NDW06GW03-R01	NDW06MW03	WG	9-5-03 13:30	11	X	X	X	X	X	X	X	X	X	03
4	NDW06GW04-R01	NDW06MW04	WG												
5	NDW06GW05-R01	NDW06MW05	WG	9-5-03 10:25	11	X	X	X	X	X	X	X	X	X	04
6	NDW06GW06-R01	NDW06MW06	WG	9-5-03 13:30	11	X	X	X	X	X	X	X	X	X	05
7	NDW06GW07-R01	NDW06MW07	WG												
8	NDW06GW08-R01	NDW06MW08	WG			X	X	X	X	X	X	X	X	X	Use Extra Samples for MS/MSD
9	NDW06FD01P-R01	NDW06MW05	WG	9-5-03	11	X	X	X	X	X	X	X	X	X	06
10	NDW06GWTB01-03	FIELDQC	WQ	9-5-03 15:00	3						X				07
11	NDW06GWTB02-03	FIELDQC	WQ												

Sampled By: Isaac Lynch Date/Time: 9/5/03 15:00 Custody Seal: Y / N Relinquished By: Isaac Lynch Date/Time: 9/5/03 15:00

Shipped Via: UPS (FedEx) Hand Other (Please specify):

Samples Temperature and Condition Upon Receipt (for lab's use): TEMP ON ARRIVAL 2.8, 2.8, 3.1, 3.6, 3.2, 4.0C 3 of 2

Received By: Carolyn Menardie Date/Time: 9/6/03 10:45 Custody Seal: Y / N Relinquished By: Date/Time:

Received By: Date/Time: Custody Seal: Y / N Relinquished By: Date/Time:

Remarks:
t

Vieques 4 RIFS

CH2M HILL

Chain of Custody Form

2310-013cm

Project Site	SWMU 6
Project Manager	Marty Clasen
Contact Tel No.	813-874-6622
Contact Address	4350 W. Cypress Street, Suite 600, Tampa, FL 33607
Lab Name	PEL Laboratories, Inc.
Lab Contact	Eric Battista
Lab Address	4420 Pendola Point Rd. Tampa, FL 33619

Item	Sample ID	Station ID	Matrix	Date & Time Collected	Number of Containers	ALK_W	CL_W, SO4_W, NO3_W, NO2_W, OPO4_W	CMET_W	CPEST_W_LCPCB_W_L	CSVOL_W	CVOL_W_L	DISSALK_W	DISSCL_W, DISSSO4_W, DISSNO3_W, DISSNO2_W, DISSOPO4_W	DISSMET_W	EXP_W	PERC_W		Comments
1	NDW06SW02-R01	NDW06SW02	WS	10/01/03 0920	13	X	X	X	X	X	X	X	X	X	X	X		01
2	NDW06SW03-R01	NDW06SW03	WS	10/01/03 0845	13	X	X	X	X	X	X	X	X	X	X	X		02
3	NDW06SW05-R01	NDW06SW05	WS	10/01/03 0810	13	X	X	X	X	X	X	X	X	X	X	X		03
4	NDW06SW06-R01	NDW06SW06	WS	9/29/03 1420	13	X	X	X	X	X	X	X	X	X	X	X		04
5	NDW06SW07-R01	NDW06SW07	WS	9/29/03 1450	13	X	X	X	X	X	X	X	X	X	X	X		05
6	NDW06SW08-R01	NDW06SW08	WS	10/01/03 1050	39	X	X	X	X	X	X	X	X	X	X	X		Use Extra Samples for MS/MSD 06, 07, 08
7	NDW06SW09-R01	NDW06SW09	WS	10/01/03 1200	13	X	X	X	X	X	X	X	X	X	X	X		09
8	NDW06SW10K-R01	NDW06SW10	WS	9/29/03 1545	13	X	X	X	X	X	X	X	X	X	X	X		10
9	NDW06SW11K-R01	NDW06SW11	WS	9/29/03 1615	13	X	X	X	X	X	X	X	X	X	X	X		11
10	NDW06FD02P-R01	NDW06SW02	WS	10/01/03 0920	13	X	X	X	X	X	X	X	X	X	X	X		12
14	NDW06SWTB01-03	FIELDQC	WQ	10/01/03 0900	3						X							13

Analysis Requested

Project No. 171119

Lab Batch/SDG ID

Lab Tel No./Fax No. 813-247-2805 / 813-248-1637

Sampled By: Rick Gorsira/Isaac Lynch | Date/Time: varies | Custody Seal: Y / N | Relinquished By: | Date/Time: 10/01/03 1330

Shipped Via: UPS FedEx Hand Other (Please specify):

Samples Temperature and Condition Upon Receipt (for lab's use): TEMP ARRIVAL 3.8, 4.0, 4.0, 4.5, 4.6, 4.6, 4.9c pH<2 (8260, 6010)

Received By:	Date/Time:	Custody Seal: Y / N	Relinquished By:	Date/Time:
[illegible]	10/02/03 10:15			
Received By:	Date/Time:	Custody Seal: Y / N	Relinquished By:	Date/Time:

Remarks: Average conductivity of samples is 55mS/cm.
SAMPLE 10 - DISS. WET CHEM METHODS REC'D PERSERVED WITH HNO3

EXHIBIT 1
Number of Samples Collected by Matrix, Type, and Method

Matrix	Analytical Method	Analytical Method Description	Prep Method	Filtered ?	N	FD	AB	EB	TB
SB	SW8330	Explosives By HPLC	METHOD	NO	8	1			
SD	SW8330	Explosives By HPLC	METHOD	NO	21	2			
SS	SW8330	Explosives By HPLC	METHOD	NO	23	2			
WG	SW8330	Explosives By HPLC	METHOD	NO	15	2			
WS	SW8330	Explosives By HPLC	METHOD	NO	16	2	5	10	
SB	SW8270C	Semivolatile Organics by GC/MS	SW3550	NO	12	2			
SD	SW8270C	Semivolatile Organics by GC/MS	SW3550	NO	21	2			
SS	SW8270C	Semivolatile Organics by GC/MS	SW3550	NO	24	2			
WG	SW8270C	Semivolatile Organics by GC/MS	SW3510	NO	16	2			
WS	SW8270C	Semivolatile Organics by GC/MS	SW3510	NO	16	2	5	12	
SB	SW8260B	Volatile Organic Compounds by GCMS	SW5030	NO	12	2			
SD	SW8260B	Volatile Organic Compounds by GCMS	SW5030	NO	21	2			
SS	SW8260B	Volatile Organic Compounds by GCMS	SW5030	NO	24	2			
WG	SW8260B	Volatile Organic Compounds by GCMS	SW5030	NO	16	2			
WS	SW8260B	Volatile Organic Compounds by GCMS	SW5030	NO	16	2	5	12	11
SB	SW8082	PCBs	SW3550	NO	8	1			
SD	SW8082	PCBs	SW3550	NO	21	2			
SS	SW8082	PCBs	SW3550	NO	23	2			
WG	SW8082	PCBs	SW3510	NO	16	2			
WS	SW8082	PCBs	SW3510	NO	16	2	5	11	
SB	SW8081	Organochlorine Pesticides	SW3550	NO	8	1			
SD	SW8081	Organochlorine Pesticides	SW3550	NO	21	2			
SS	SW8081	Organochlorine Pesticides	SW3550	NO	23	2			
WG	SW8081	Organochlorine Pesticides	SW3510	NO	16	2			
WS	SW8081	Organochlorine Pesticides	SW3510	NO	16	2	5	11	
SB	SW7471A	Mercury in Solid (CVAA)	METHOD	NO	8	1			
SD	SW7471A	Mercury in Solid (CVAA)	METHOD	NO	21	2			
SS	SW7471A	Mercury in Solid (CVAA)	METHOD	NO	23	2			
WG	SW7470A	Mercury in Liquid (CVAA)	SW3005	NO	16	2	5	11	
WG	SW7470A	Mercury in Liquid (CVAA)	SW3005	FLDFLT	16	2			
WS	SW7470A	Mercury in Liquid (CVAA)	SW3005	NO	16	2			
WS	SW7470A	Mercury in Liquid (CVAA)	SW3005	FLDFLT	9	1	1	2	
SB	SW6010B	Metals by ICPES	SW3050B	NO	8	1			
SD	SW6010B	Metals by ICPES	SW3050B	NO	21	2			
SS	SW6010B	Metals by ICPES	SW3050B	NO	23	2			
WG	SW6010B	Metals by ICPES	SW3010A	NO	16	2			
WG	SW6010B	Metals by ICPES	SW3010A	FLDFLT	16	2			
WS	SW6010B	Metals by ICPES	SW3010A	NO	16	2	5	11	
WS	SW6010B	Metals by ICPES	SW3010A	FLDFLT	9	1	1	2	
WG	E375.4	Sulfate (As SO4), Turbidimetric	METHOD	NO	8	1	2	3	
WS	E375.4	Sulfate (As SO4), Turbidimetric	METHOD	NO	9	1			
WS	E375.4	Sulfate (As SO4), Turbidimetric	METHOD	FLDFLT	9	1			
WG	E365.2	Phosphorus, All Forms (as P)	METHOD	NO	8	1	2	3	
WS	E365.2	Phosphorus, All Forms (as P)	METHOD	NO	9	1			
WS	E365.2	Phosphorus, All Forms (as P)	METHOD	FLDFLT	9	1			
WG	E354.1	Nitrogen, Nitrite (Spectrophotometric)	METHOD	NO	8	1	2	3	
WS	E354.1	Nitrogen, Nitrite (Spectrophotometric)	METHOD	NO	9	1			
WS	E354.1	Nitrogen, Nitrite (Spectrophotometric)	METHOD	FLDFLT	9	1			
WG	E353.2	Nitrate-Nitrite (Automated Colorimetric)	METHOD	NO	8	1	2	3	
WS	E353.2	Nitrate-Nitrite (Automated Colorimetric)	METHOD	NO	9	1			
WS	E353.2	Nitrate-Nitrite (Automated Colorimetric)	METHOD	FLDFLT	9	1			
WG	E325.2	Chloride (As CL), Automated Colorimetric	METHOD	NO	8	1	2	2	
WS	E325.2	Chloride (As CL), Automated Colorimetric	METHOD	NO	9	1		1	
WS	E325.2	Chloride (As CL), Automated Colorimetric	METHOD	FLDFLT	9	1			
SD	E314.0	Perchlorate by Ion Chromatography	METHOD	NO	14	1			
SS	E314.0	Perchlorate by Ion Chromatography	METHOD	NO	15	1			
WG	E314.0	Perchlorate by Ion Chromatography	METHOD	NO	16	2			
WS	E314.0	Perchlorate by Ion Chromatography	METHOD	NO	9	1	4	8	
WG	E310.1	Alkalinity (Titrimetric)	METHOD	NO	8	1	2	2	
WS	E310.1	Alkalinity (Titrimetric)	METHOD	NO	9	1		1	
WS	E310.1	Alkalinity (Titrimetric)	METHOD	FLDFLT	9	1			

EXHIBIT 2

Data Validation Sub-Qualifiers and Their Definitions

Code	Definition
TN	Tune
BS	Blank Spike/LCS
IS	Internal Standard
MS	Matrix Spike and/or Matrix Spike Duplicate Recovery
MD	Matrix Spike/Matrix Spike Duplicate Precision
2S	Second Source
SD	Serial Dilution
SS	Spiked Surrogate
LR	Lab Re-extraction or Re-Analysis
IC	Initial Calibration
CC	Continuing Calibration Verification
PD	Pesticide Degradation
LD	Lab Duplicate
2C	Second Column (Confirmation)
HT	Holding Time
TD	Dissolved Concentration Greater Than the Total
PS	Post Spike
BL	Blank
RE	Re-extraction
DL	Dilution
IB	In Between MDL and RL
FD	Field Duplicate
OT	Other (Defined in DV Worksheet)
Order of Qualifiers is in Order of Importance, Impact on the Data	

EXHIBIT 3
Data Rejected Through the Data Validation Process

Matrix	Sample ID	Sample Type	LR Type	Parameter	Lab Result	Lab Qual	Final Qual	DL	RL	Units	DV Notes
WG	NDW06GW05-R01	N		Aldrin	0.01	U	R	0.002	0.01	ug/L	SS
WG	NDW06GW05-R01	N		alpha bhc	0.01	U	R	0.0012	0.01	ug/L	SS
WG	NDW06GW05-R01	N		alpha endosulfan	0.01	U	R	0.0043	0.01	ug/L	SS
WG	NDW06GW05-R01	N		alpha-chlordane	0.01	U	R	0.0022	0.01	ug/L	SS
WG	NDW06GW05-R01	N		beta bhc	0.01	U	R	0.0018	0.01	ug/L	SS
WG	NDW06GW05-R01	N		delta bhc	0.01	U	R	0.0058	0.01	ug/L	SS
WG	NDW06GW05-R01	N		gamma bhc (lindane)	0.01	U	R	0.0019	0.01	ug/L	SS
WG	NDW06GW05-R01	N		gamma-chlordane	0.01	U	R	0.0025	0.01	ug/L	SS
WG	NDW06GW05-R01	N		heptachlor	0.01	U	R	0.0022	0.01	ug/L	SS
WG	NDW06GW05-R01	N		heptachlor epoxide	0.01	U	R	0.0025	0.01	ug/L	SS
WG	NDW06GW05-R01	N		beta endosulfan	0.02	U	R	0.0018	0.02	ug/L	SS
WG	NDW06GW05-R01	N		Dieldrin	0.02	U	R	0.0038	0.02	ug/L	SS
WG	NDW06GW05-R01	N		endosulfan sulfate	0.02	U	R	0.0022	0.02	ug/L	SS
WG	NDW06GW05-R01	N		endrin	0.02	U	R	0.0044	0.02	ug/L	SS
WG	NDW06GW05-R01	N		endrin aldehyde	0.02	U	R	0.0051	0.02	ug/L	SS
WG	NDW06GW05-R01	N		endrin ketone	0.02	U	R	0.0034	0.02	ug/L	SS
WG	NDW06GW05-R01	N		p,p'-DDD	0.02	U	R	0.004	0.02	ug/L	SS
WG	NDW06GW05-R01	N		p,p'-DDE	0.02	U	R	0.0056	0.02	ug/L	SS
WG	NDW06GW05-R01	N		p,p'-DDT	0.02	U	R	0.0044	0.02	ug/L	SS
WG	NDW06GW05-R01	N		toxaphene	0.05	U	R	0.031	0.05	ug/L	SS
WG	NDW06GW05-R01	N		methoxychlor	0.1	U	R	0.003	0.1	ug/L	SS
WS	NDA035	N		Mercury	0.18	U	R	0.18	0.2	UG/L	MS
WS	NDA036	N		Mercury	0.18	U	R	0.18	0.2	UG/L	MS
WS	NDA038FD1	FD		Mercury	0.18	U	R	0.18	0.2	UG/L	MS
WS	NDA039	N		Mercury	0.18	U	R	0.18	0.2	UG/L	MS
WS	NDA040	N		Mercury	0.18	U	R	0.18	0.2	UG/L	MS
WS	NDA300	N		Mercury	0.18	U	R	0.18	0.2	UG/L	MS
WS	NDA301	N		Mercury	0.18	U	R	0.18	0.2	UG/L	MS
WS	NDW06SW02-R01	N		1,2,3-trichlorobenzene	0.5	U	R	0.14	0.5	ug/L	BS
WS	NDW06SW03-R01	N		1,2,3-trichlorobenzene	0.5	U	R	0.14	0.5	ug/L	BS
WS	NDW06SW05-R01	N		1,2,3-trichlorobenzene	0.5	U	R	0.14	0.5	ug/L	BS
WS	NDW06SW06-R01	N		1,2,3-trichlorobenzene	0.5	U	R	0.14	0.5	ug/L	BS
WS	NDW06SW07-R01	N		1,2,3-trichlorobenzene	0.5	U	R	0.14	0.5	ug/L	BS
WS	NDW06SW08-R01	N		1,2,3-trichlorobenzene	0.5	U	R	0.14	0.5	ug/L	BS
WS	NDW06SW09-R01	N		1,2,3-trichlorobenzene	0.5	U	R	0.14	0.5	ug/L	BS
WS	NDW06SW10K-R01	N		1,2,3-trichlorobenzene	0.5	U	R	0.14	0.5	ug/L	BS
WS	NDW06SW11K-R01	N		1,2,3-trichlorobenzene	0.5	U	R	0.14	0.5	ug/L	BS
WS	NDW06FD02P-R01	FD		1,2,3-trichlorobenzene	0.5	U	R	0.14	0.5	ug/L	BS
WG	NDW06GW04-R01	N		1,2-Dichlorobenzene	0.5	U	R	0.18	0.5	ug/L	BS
WG	NDW06GW07-R01	N		1,2-Dichlorobenzene	0.5	U	R	0.18	0.5	ug/L	BS
WG	NDW06GW08-R01	N		1,2-Dichlorobenzene	0.5	U	R	0.18	0.5	ug/L	BS

EXHIBIT 3

Data Rejected Through the Data Validation Process

Matrix	Sample ID	Sample Type	LR Type	Parameter	Lab Result	Lab Qual	Final Qual	DL	RL	Units	DV Notes
WG	NDW06GW04-R01	N		Isopropylbenzene (Cumene)	0.5	U	R	0.18	0.5	ug/L	BS
WG	NDW06GW07-R01	N		Isopropylbenzene (Cumene)	0.5	U	R	0.18	0.5	ug/L	BS
WG	NDW06GW08-R01	N		Isopropylbenzene (Cumene)	0.5	U	R	0.18	0.5	ug/L	BS
WS	NDW06SW02-R01	N		Isopropylbenzene (Cumene)	0.5	U	R	0.18	0.5	ug/L	BS
WS	NDW06SW03-R01	N		Isopropylbenzene (Cumene)	0.5	U	R	0.18	0.5	ug/L	BS
WS	NDW06SW05-R01	N		Isopropylbenzene (Cumene)	0.5	U	R	0.18	0.5	ug/L	BS
WS	NDW06SW06-R01	N		Isopropylbenzene (Cumene)	0.5	U	R	0.18	0.5	ug/L	BS
WS	NDW06SW07-R01	N		Isopropylbenzene (Cumene)	0.5	U	R	0.18	0.5	ug/L	BS
WS	NDW06SW08-R01	N		Isopropylbenzene (Cumene)	0.5	U	R	0.18	0.5	ug/L	BS
WS	NDW06SW09-R01	N		Isopropylbenzene (Cumene)	0.5	U	R	0.18	0.5	ug/L	BS
WS	NDW06SW10K-R01	N		Isopropylbenzene (Cumene)	0.5	U	R	0.18	0.5	ug/L	BS
WS	NDW06SW11K-R01	N		Isopropylbenzene (Cumene)	0.5	U	R	0.18	0.5	ug/L	BS
WS	NDW06FD02P-R01	FD		Isopropylbenzene (Cumene)	0.5	U	R	0.18	0.5	ug/L	BS
WG	NDW06GW04-R01	N		1,2-Dibromo-3-chloropropane	2	U	R	0.78	2	ug/L	BS
WG	NDW06GW07-R01	N		1,2-Dibromo-3-chloropropane	2	U	R	0.78	2	ug/L	BS
WG	NDW06GW08-R01	N		1,2-Dibromo-3-chloropropane	2	U	R	0.78	2	ug/L	BS
SD	NDW06FD03P-R01	FD		Aldrin	2.3	U	R	0.14	2.3	ug/Kg	SS
SD	NDW06FD03P-R01	FD		alpha bhc	2.3	U	R	0.15	2.3	ug/Kg	SS
SD	NDW06FD03P-R01	FD		alpha endosulfan	2.3	U	R	0.094	2.3	ug/Kg	SS
SD	NDW06FD03P-R01	FD		alpha-chlordane	2.3	U	R	0.15	2.3	ug/Kg	SS
SD	NDW06FD03P-R01	FD		beta bhc	2.3	U	R	0.082	2.3	ug/Kg	SS
SD	NDW06FD03P-R01	FD		delta bhc	2.3	U	R	0.098	2.3	ug/Kg	SS
SD	NDW06FD03P-R01	FD		gamma bhc (lindane)	2.3	U	R	0.15	2.3	ug/Kg	SS
SD	NDW06FD03P-R01	FD		gamma-chlordane	2.3	U	R	0.15	2.3	ug/Kg	SS
SD	NDW06FD03P-R01	FD		heptachlor	2.3	U	R	0.14	2.3	ug/Kg	SS
SD	NDW06FD03P-R01	FD		heptachlor epoxide	2.3	U	R	0.11	2.3	ug/Kg	SS
SD	NDW06SD14-R01	N		Aldrin	2.6	U	R	0.15	2.6	ug/Kg	SS
SD	NDW06SD14-R01	N		alpha bhc	2.6	U	R	0.17	2.6	ug/Kg	SS
SD	NDW06SD14-R01	N		alpha endosulfan	2.6	U	R	0.1	2.6	ug/Kg	SS
SD	NDW06SD14-R01	N		alpha-chlordane	2.6	U	R	0.17	2.6	ug/Kg	SS
SD	NDW06SD14-R01	N		beta bhc	2.6	U	R	0.091	2.6	ug/Kg	SS
SD	NDW06SD14-R01	N		delta bhc	2.6	U	R	0.11	2.6	ug/Kg	SS
SD	NDW06SD14-R01	N		gamma bhc (lindane)	2.6	U	R	0.17	2.6	ug/Kg	SS
SD	NDW06SD14-R01	N		gamma-chlordane	2.6	U	R	0.17	2.6	ug/Kg	SS
SD	NDW06SD14-R01	N		heptachlor	2.6	U	R	0.15	2.6	ug/Kg	SS
SD	NDW06SD14-R01	N		heptachlor epoxide	2.6	U	R	0.12	2.6	ug/Kg	SS
SD	NDW06SD13-R01	N		Zinc	29.7	=	R	0.0766	4.06	mg/Kg	BL
SD	NDW06FD03P-R01	FD		Zinc	4.42	=	R	0.0779	4.13	mg/Kg	BL
SD	NDW06SD11-R01	N		Zinc	5.9	=	R	0.0814	4.32	mg/Kg	BL
SD	NDW06SD02-R01	N		Zinc	5.08	=	R	0.082	4.35	mg/Kg	BL
SD	NDW06SD14-R01	N		Zinc	8.54	=	R	0.0848	4.5	mg/Kg	BL

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Matrix	Sample ID	Sample Type	LR Type	Parameter	Lab Result	Lab Qual	Final Qual	DL	RL	Units	DV Notes
SD	NDW06FD03P-R01	FD		beta endosulfan	4.5	U	R	0.064	4.5	ug/Kg	SS
SD	NDW06FD03P-R01	FD		Dieldrin	4.5	U	R	0.049	4.5	ug/Kg	SS
SD	NDW06FD03P-R01	FD		endosulfan sulfate	4.5	U	R	0.34	4.5	ug/Kg	SS
SD	NDW06FD03P-R01	FD		endrin	4.5	U	R	0.12	4.5	ug/Kg	SS
SD	NDW06FD03P-R01	FD		endrin aldehyde	4.5	U	R	0.24	4.5	ug/Kg	SS
SD	NDW06FD03P-R01	FD		endrin ketone	4.5	U	R	0.26	4.5	ug/Kg	SS
SD	NDW06FD03P-R01	FD		p,p'-DDE	0.35	JP	R	0.073	4.5	ug/Kg	SS
SD	NDW06FD03P-R01	FD		p,p'-DDT	4.5	U	R	0.26	4.5	ug/Kg	SS
WS	NDW06SW05-R01	N		caprolactam	5	U	R	0.3	5	ug/L	BS
WS	NDW06SW06-R01	N		caprolactam	5	U	R	0.3	5	ug/L	BS
WS	NDW06SW07-R01	N		caprolactam	5	U	R	0.3	5	ug/L	BS
WS	NDW06SW08-R01	N		caprolactam	5	U	R	0.3	5	ug/L	BS
WS	NDW06SW10K-R01	N		caprolactam	5	U	R	0.3	5	ug/L	BS
SD	NDW06SD14-R01	N		beta endosulfan	5	U	R	0.071	5	ug/Kg	SS
SD	NDW06SD14-R01	N		Dieldrin	5	U	R	0.054	5	ug/Kg	SS
SD	NDW06SD14-R01	N		endosulfan sulfate	5	U	R	0.38	5	ug/Kg	SS
SD	NDW06SD14-R01	N		endrin	5	U	R	0.13	5	ug/Kg	SS
SD	NDW06SD14-R01	N		endrin aldehyde	5	U	R	0.27	5	ug/Kg	SS
SD	NDW06SD14-R01	N		endrin ketone	5	U	R	0.29	5	ug/Kg	SS
SD	NDW06SD14-R01	N		p,p'-DDE	5	U	R	0.082	5	ug/Kg	SS
WG	NDW06FD01P-R01	FD		caprolactam	5.1	U	R	0.3	5.1	ug/L	BS
WG	NDW06GW07-R01	N		caprolactam	5.1	U	R	0.3	5.1	ug/L	BS
WG	NDW06GW08-R01	N		caprolactam	5.1	U	R	0.3	5.1	ug/L	BS
WG	NDW06GW02-R01	N		caprolactam	5.2	U	R	0.31	5.2	ug/L	BS
WG	NDW06GW06-R01	N		caprolactam	5.2	U	R	0.31	5.2	ug/L	BS
WG	NDW06GW04-R01	N		caprolactam	5.2	U	R	0.3	5.2	ug/L	BS
WS	NDW06SW09-R01	N		caprolactam	5.2	U	R	0.31	5.2	ug/L	BS
WS	NDW06SW11K-R01	N		caprolactam	5.2	U	R	0.3	5.2	ug/L	BS
WG	NDW06GW05-R01	N		caprolactam	5.3	U	R	0.31	5.3	ug/L	BS
WS	NDW06SW02-R01	N		caprolactam	5.3	U	R	0.31	5.3	ug/L	BS
WS	NDW06FD02P-R01	FD		caprolactam	5.4	U	R	0.32	5.4	ug/L	BS
SD	NDW06SD07-R01	N		Aldrin	5.5	U	R	0.32	5.5	ug/Kg	SS
SD	NDW06SD07-R01	N		alpha bhc	5.5	U	R	0.35	5.5	ug/Kg	SS
SD	NDW06SD07-R01	N		alpha endosulfan	5.5	U	R	0.22	5.5	ug/Kg	SS
SD	NDW06SD07-R01	N		alpha-chlordane	5.5	U	R	0.35	5.5	ug/Kg	SS
SD	NDW06SD07-R01	N		beta bhc	5.5	U	R	0.19	5.5	ug/Kg	SS
SD	NDW06SD07-R01	N		delta bhc	5.5	U	R	0.23	5.5	ug/Kg	SS
SD	NDW06SD07-R01	N		gamma bhc (lindane)	5.5	U	R	0.35	5.5	ug/Kg	SS
SD	NDW06SD07-R01	N		gamma-chlordane	5.5	U	R	0.35	5.5	ug/Kg	SS
SD	NDW06SD07-R01	N		heptachlor	5.5	U	R	0.32	5.5	ug/Kg	SS
SD	NDW06SD07-R01	N		heptachlor epoxide	5.5	U	R	0.25	5.5	ug/Kg	SS

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Matrix	Sample ID	Sample Type	LR Type	Parameter	Lab Result	Lab Qual	Final Qual	DL	RL	Units	DV Notes
SD	NDW06SD03-R01	N		Zinc	27.5	=	R	0.136	7.19	mg/Kg	BL
SS	NDA113	N		2-butanone (MEK)	10	U	R	2	10	UG/KG	CC
SS	NDA115	N		2-butanone (MEK)	10	U	R	2	10	UG/KG	CC
SS	NDA117	N		2-butanone (MEK)	10	U	R	2	10	UG/KG	CC
WS	NDA035	N		2-butanone (MEK)	10	U	R	2	10	UG/L	CC
WS	NDA036	N		2-butanone (MEK)	10	U	R	2	10	UG/L	CC
WS	NDA037	N		2-butanone (MEK)	10	U	R	2	10	UG/L	CC
WS	NDA038FD1	FD		2-butanone (MEK)	10	U	R	2	10	UG/L	CC
WS	NDA039	N		2-butanone (MEK)	10	U	R	2	10	UG/L	CC
WS	NDA040	N		2-butanone (MEK)	10	U	R	2	10	UG/L	CC
WS	NDA300	N		2-butanone (MEK)	10	U	R	2	10	UG/L	CC
WS	NDA301	N		2-butanone (MEK)	10	U	R	2	10	UG/L	CC
SB	NDA093	N		Acetone	39	=	R	9	10	UG/KG	CC
SS	NDA113	N		Acetone	10	U	R	10	10	UG/KG	CC
WS	NDA035	N		Acetone	10	U	R	10	10	UG/L	CC
WS	NDA036	N		Acetone	10	U	R	10	10	UG/L	CC
WS	NDA037	N		Acetone	10	U	R	10	10	UG/L	CC
WS	NDA038FD1	FD		Acetone	10	U	R	10	10	UG/L	CC
WS	NDA039	N		Acetone	10	U	R	10	10	UG/L	CC
WS	NDA040	N		Acetone	10	U	R	10	10	UG/L	CC
WS	NDA300	N		Acetone	10	U	R	10	10	UG/L	CC
WS	NDA301	N		Acetone	10	U	R	10	10	UG/L	CC
SB	NDA095FD1	FD		Acetone	41	=	R	10	10	UG/KG	CC, BL
SS	NDA115	N		Acetone	20	=	R	10	10	UG/KG	CC, BL
SS	NDA117	N		Acetone	11	=	R	10	10	UG/KG	CC, BL
WG	NDA0321FD1	FD		2-butanone (MEK)	10	U	R	2	10	UG/L	IC, CC
WG	NDA0321FD1	FD		Acetone	10	U	R	10	10	UG/L	IC, CC
WS	NDW06SW03-R01	N		1,2,4,5-tetrachlorobenzene	10.3	U	R	2.5	10.3	ug/L	BS
WS	NDW06SW03-R01	N		caprolactam	10.3	U	R	0.61	10.3	ug/L	BS
SB	NDA112	N		Acetone	12	=	R	11	11	UG/KG	BL, CC
SB	NDA114	N		2-butanone (MEK)	11	U	R	2	11	UG/KG	CC
SB	NDA116	N		2-butanone (MEK)	11	U	R	2	11	UG/KG	CC
SB	NDA110	N		2-butanone (MEK)	11	U	R	2	11	UG/KG	CC
SB	NDA112	N		2-butanone (MEK)	11	U	R	2	11	UG/KG	CC
SS	NDA109	N		2-butanone (MEK)	11	U	R	2	11	UG/KG	CC
SB	NDA092	N		Acetone	40	=	R	11	11	UG/KG	CC
SB	NDA110	N		Acetone	11	U	R	11	11	UG/KG	CC
SD	NDA043	N		Acetone	36	=	R	11	11	UG/KG	CC
SS	NDA109	N		Acetone	11	U	R	11	11	UG/KG	CC
SB	NDA114	N		Acetone	13	=	R	11	11	UG/KG	CC, BL
SB	NDA116	N		Acetone	26	=	R	11	11	UG/KG	CC, BL

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Matrix	Sample ID	Sample Type	LR Type	Parameter	Lab Result	Lab Qual	Final Qual	DL	RL	Units	DV Notes
SD	NDW06SD07-R01	N		beta endosulfan	11	U	R	0.15	11	ug/Kg	SS
SD	NDW06SD07-R01	N		Dieldrin	11	U	R	0.12	11	ug/Kg	SS
SD	NDW06SD07-R01	N		endosulfan sulfate	11	U	R	0.8	11	ug/Kg	SS
SD	NDW06SD07-R01	N		endrin	11	U	R	0.28	11	ug/Kg	SS
SD	NDW06SD07-R01	N		endrin aldehyde	11	U	R	0.58	11	ug/Kg	SS
SD	NDW06SD07-R01	N		endrin ketone	11	U	R	0.61	11	ug/Kg	SS
SD	NDW06SD07-R01	N		p,p'-DDD	11	U	R	0.42	11	ug/Kg	SS
SD	NDW06SD07-R01	N		p,p'-DDE	11	U	R	0.17	11	ug/Kg	SS
SD	NDW06SD07-R01	N		p,p'-DDT	11	U	R	0.61	11	ug/Kg	SS
SB	NDA118	N		2-butanone (MEK)	12	U	R	2	12	UG/KG	CC
SS	NDA107	N		2-butanone (MEK)	12	U	R	2	12	UG/KG	CC
SS	NDA111	N		2-butanone (MEK)	12	U	R	2	12	UG/KG	CC
SB	NDA085	N		Acetone	29	=	R	12	12	UG/KG	CC
SB	NDA094	N		Acetone	50	=	R	12	12	UG/KG	CC
SD	NDA042	N		Acetone	37	=	R	12	12	UG/KG	CC
SS	NDA107	N		Acetone	12	U	R	12	12	UG/KG	CC
SS	NDA111	N		Acetone	12	U	R	12	12	UG/KG	CC
SB	NDA118	N		Acetone	67	=	R	12	12	UG/KG	CC, BL
SB	NDA108	N		Acetone	18	=	R	13	13	UG/KG	BL, CC
SS	NDA103	N		Acetone	25	=	R	13	13	UG/KG	BL, CC
SB	NDA108	N		2-butanone (MEK)	13	U	R	2	13	UG/KG	CC
SS	NDA103	N		2-butanone (MEK)	13	U	R	2	13	UG/KG	CC
SS	NDA084	N		Acetone	36	=	R	13	13	UG/KG	CC
SS	NDA104FD1	FD		2-butanone (MEK)	14	U	R	2	14	UG/KG	CC
SS	NDA104FD1	FD		Acetone	14	U	R	14	14	UG/KG	CC
SB	NDA102	N		Acetone	25	=	R	14	14	UG/KG	CC, BL
SS	NDA101	N		Acetone	20	=	R	14	14	UG/KG	CC, BL
SB	NDA106FD1	FD		Acetone	21	=	R	16	16	UG/KG	BL, CC
SB	NDA106FD1	FD		2-butanone (MEK)	16	U	R	3	16	UG/KG	CC
SB	NDA105	N		Acetone	22	=	R	17	17	UG/KG	BL, CC
SB	NDA105	N		2-butanone (MEK)	17	U	R	3	17	UG/KG	CC
SD	NDW06FD03P-R01	FD		methoxychlor	23	U	R	0.35	23	ug/Kg	SS
SD	NDA302	N		2-butanone (MEK)	26	U	R	4	26	UG/KG	CC
SD	NDA302	N		Acetone	41	=	R	26	26	UG/KG	CC, BL
SD	NDW06SD14-R01	N		methoxychlor	26	U	R	0.39	26	ug/Kg	SS
SD	NDA045	N		2-butanone (MEK)	36	U	R	6	36	UG/KG	CC
SD	NDA045	N		Acetone	70	=	R	36	36	UG/KG	CC
SD	NDA046	N		Acetone	97	=	R	43	43	UG/KG	CC
SD	NDA303	N		Acetone	100	=	R	47	47	UG/KG	BL, CC
SD	NDW06SD07-R01	N		methoxychlor	55	U	R	0.84	55	ug/Kg	SS
SD	NDA307FD1	FD		Acetone	145	=	R	56	56	UG/KG	CC, BL

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Matrix	Sample ID	Sample Type	LR Type	Parameter	Lab Result	Lab Qual	Final Qual	DL	RL	Units	DV Notes
SD	NDA044	N		Acetone	140	=	R	59	59	UG/KG	CC
WG	NDA005	N		Iron	12.2	U	R	12.2	100	UG/L	MS
WG	NDA006	N		Iron	12.2	U	R	12.2	100	UG/L	MS
WG	NDA009	N		Iron	12.2	U	R	12.2	100	UG/L	MS
WG	NDA012	N		Iron	12.2	U	R	12.2	100	UG/L	MS
WG	NDA0321FD1	FD		Iron	12.2	U	R	12.2	100	UG/L	MS
SD	NDW06FD03P-R01	FD		toxaphene	230	U	R	0.76	230	ug/Kg	SS
SD	NDW06SD14-R01	N		toxaphene	260	U	R	0.85	260	ug/Kg	SS
SS	NDA104FD1	FD		1,3,5-trinitrobenzene	355	U	R	28	355	UG/KG	SS
SS	NDA104FD1	FD		1,3-dinitrobenzene	355	U	R	62	355	UG/KG	SS
SS	NDA104FD1	FD		2,4,6-trinitrotoluene	355	U	R	47	355	UG/KG	SS
SS	NDA104FD1	FD		2,4-Dinitrotoluene	355	U	R	43	355	UG/KG	SS
SS	NDA104FD1	FD		2,6-Dinitrotoluene	355	U	R	64	355	UG/KG	SS
SS	NDA104FD1	FD		2-nitrotoluene	355	U	R	91	355	UG/KG	SS
SS	NDA104FD1	FD		3-nitrotoluene	355	U	R	136	355	UG/KG	SS
SS	NDA104FD1	FD		4-nitrotoluene	355	U	R	91	355	UG/KG	SS
SS	NDA104FD1	FD		Hexahydro-1,3,5-trinitro-1,3,5-triazine	355	U	R	37	355	UG/KG	SS
SS	NDA104FD1	FD		Nitrobenzene	355	U	R	91	355	UG/KG	SS
SS	NDA104FD1	FD		octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine	355	U	R	176	355	UG/KG	SS
SS	NDA104FD1	FD		tetryl	355	U	R	92	355	UG/KG	SS
SD	NDW06SD10-R01	N		2,4,6-Trichlorophenol	408	U	R	48.2	408	ug/Kg	BS
SD	NDW06SD10-R01	N		Benzaldehyde	408	U	R	59.3	408	ug/Kg	BS
SD	NDW06SD10-R01	N		Bis(2-Chloroethoxy) methane	408	U	R	32.1	408	ug/Kg	BS
SD	NDW06SD10-R01	N		Hexachloroethane	408	U	R	43.2	408	ug/Kg	BS
SD	NDW06SD10-R01	N		Naphthalene	408	U	R	35.8	408	ug/Kg	BS
SD	NDW06SD13-R01	N		4-Chloroaniline	433	U	R	32.8	433	ug/Kg	BS
SD	NDW06SD13-R01	N		Benzaldehyde	433	U	R	63	433	ug/Kg	BS
SD	NDW06SD11-R01	N		4-Chloroaniline	444	U	R	33.7	444	ug/Kg	BS
SD	NDW06SD11-R01	N		Benzaldehyde	444	U	R	64.6	444	ug/Kg	BS
SD	NDW06FD03P-R01	FD		4-Chloroaniline	448	U	R	33.9	448	ug/Kg	BS
SD	NDW06FD03P-R01	FD		Benzaldehyde	448	U	R	65.1	448	ug/Kg	BS
SD	NDW06SD02-R01	N		4-Chloroaniline	490	U	R	37.1	490	ug/Kg	BS
SD	NDW06SD02-R01	N		Benzaldehyde	490	U	R	71.3	490	ug/Kg	BS
SD	NDW06SD14-R01	N		4-Chloroaniline	500	U	R	37.9	500	ug/Kg	BS
SD	NDW06SD14-R01	N		Benzaldehyde	500	U	R	72.8	500	ug/Kg	BS
SD	NDW06SD12-R01	N		2,4,6-Trichlorophenol	512	U	R	60.5	512	ug/Kg	BS
SD	NDW06SD12-R01	N		Benzaldehyde	512	U	R	74.5	512	ug/Kg	BS
SD	NDW06SD12-R01	N		Bis(2-Chloroethoxy) methane	512	U	R	40.3	512	ug/Kg	BS
SD	NDW06SD12-R01	N		Hexachloroethane	512	U	R	54.3	512	ug/Kg	BS
SD	NDW06SD12-R01	N		Naphthalene	512	U	R	45	512	ug/Kg	BS
SD	NDW06SD07-R01	N		toxaphene	550	U	R	1.8	550	ug/Kg	SS

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Matrix	Sample ID	Sample Type	LR Type	Parameter	Lab Result	Lab Qual	Final Qual	DL	RL	Units	DV Notes
SD	NDW06SD03-R01	N		4-Chloroaniline	763	U	R	57.8	763	ug/Kg	BS
SD	NDW06SD03-R01	N		Benzaldehyde	763	U	R	111	763	ug/Kg	BS
SD	NDW06SD06-R01	N		2,4,6-Trichlorophenol	793	U	R	93.7	793	ug/Kg	BS
SD	NDW06SD06-R01	N		Benzaldehyde	793	U	R	115	793	ug/Kg	BS
SD	NDW06SD06-R01	N		Bis(2-Chloroethoxy) methane	793	U	R	62.5	793	ug/Kg	BS
SD	NDW06SD06-R01	N		Hexachloroethane	793	U	R	84.1	793	ug/Kg	BS
SD	NDW06SD06-R01	N		Naphthalene	793	U	R	69.7	793	ug/Kg	BS
SD	NDW06SD15K-R01	N		2,4,6-Trichlorophenol	800	U	R	94.5	800	ug/Kg	BS
SD	NDW06SD15K-R01	N		Acetophenone	800	U	R	75.1	800	ug/Kg	BS
SD	NDW06SD15K-R01	N		Benzaldehyde	800	U	R	116	800	ug/Kg	BS
SD	NDW06SD15K-R01	N		Bis(2-Chloroethoxy) methane	800	U	R	63	800	ug/Kg	BS
SD	NDW06SD15K-R01	N		Hexachloroethane	800	U	R	84.8	800	ug/Kg	BS
SD	NDW06SD15K-R01	N		Naphthalene	800	U	R	70.3	800	ug/Kg	BS
SD	NDW06SD16K-R01	N		2,4,6-Trichlorophenol	816	U	R	96.4	816	ug/Kg	BS
SD	NDW06SD16K-R01	N		Acetophenone	816	U	R	76.6	816	ug/Kg	BS
SD	NDW06SD16K-R01	N		Benzaldehyde	816	U	R	119	816	ug/Kg	BS
SD	NDW06SD16K-R01	N		Bis(2-Chloroethoxy) methane	816	U	R	64.2	816	ug/Kg	BS
SD	NDW06SD16K-R01	N		Hexachloroethane	816	U	R	86.5	816	ug/Kg	BS
SD	NDW06SD16K-R01	N		Naphthalene	816	U	R	71.7	816	ug/Kg	BS
SD	NDW06SD09-R01	N		2,4,6-Trichlorophenol	880	U	R	104	880	ug/Kg	BS
SD	NDW06SD09-R01	N		Benzaldehyde	880	U	R	128	880	ug/Kg	BS
SD	NDW06SD09-R01	N		Bis(2-Chloroethoxy) methane	880	U	R	69.3	880	ug/Kg	BS
SD	NDW06SD09-R01	N		Hexachloroethane	880	U	R	93.3	880	ug/Kg	BS
SD	NDW06SD09-R01	N		Naphthalene	880	U	R	77.3	880	ug/Kg	BS
SD	NDW06SD05-R01	N		4-Chloroaniline	1040	U	R	78.5	1040	ug/Kg	BS
SD	NDW06SD05-R01	N		Benzaldehyde	1040	U	R	151	1040	ug/Kg	BS
SD	NDW06SD07-R01	N		2,4,6-Trichlorophenol	1050	U	R	124	1050	ug/Kg	BS
SD	NDW06SD07-R01	N		Benzaldehyde	1050	U	R	152	1050	ug/Kg	BS
SD	NDW06SD07-R01	N		Bis(2-Chloroethoxy) methane	1050	U	R	82.5	1050	ug/Kg	BS
SD	NDW06SD07-R01	N		Hexachloroethane	1050	U	R	111	1050	ug/Kg	BS
SD	NDW06SD07-R01	N		Naphthalene	1050	U	R	92	1050	ug/Kg	BS
SD	NDW06SD08-R01	N		2,4,6-Trichlorophenol	1060	U	R	125	1060	ug/Kg	BS
SD	NDW06SD08-R01	N		Benzaldehyde	1060	U	R	154	1060	ug/Kg	BS
SD	NDW06SD08-R01	N		Bis(2-Chloroethoxy) methane	1060	U	R	83.5	1060	ug/Kg	BS
SD	NDW06SD08-R01	N		Hexachloroethane	1060	U	R	112	1060	ug/Kg	BS
SD	NDW06SD08-R01	N		Naphthalene	1060	U	R	93.1	1060	ug/Kg	BS
SD	NDW06SD15K-R01	N		Pentachlorophenol	2400	U	R	75.1	2400	ug/Kg	BS
SD	NDW06SD16K-R01	N		Pentachlorophenol	2450	U	R	76.6	2450	ug/Kg	BS

EXHIBIT 4
Change in Qualifier Through the Data Validation Process

Matrix	Sample ID	Sample Type	Analytical Method	Prep Method	Parameter	Lab Result	Lab Qual	Final Result	Final Qual	DL	RL	Units	DV Notes
SS	NDA113	N	SW8081	SW3550	alpha-chlordane	0.61	J	0.61	J	0.59	2.1	ug/Kg	2C
SD	NDW06SD10-R01	N	SW8081	SW3550	p,p'-DDD	4.1	JP	4.1	U	0.16	4.1	ug/Kg	2C
SD	NDW06SD11-R01	N	SW8081	SW3550	p,p'-DDD	1.2	JP	1.2	J	0.18	4.5	ug/Kg	2C
SS	NDW06SS12-R01	N	SW8081	SW3550	p,p'-DDD	1.8	JP	4.8	U	0.19	4.8	ug/Kg	2C
SD	NDW06SD15K-R01	N	SW8081	SW3550	p,p'-DDD	1.1	JP	1.1	J	0.32	8.0	ug/Kg	2C
SD	NDW06SD09-R01	N	SW8081	SW3550	p,p'-DDD	2.4	JP	2.4	J	0.35	8.9	ug/Kg	2C
SD	NDW06SD08-R01	N	SW8081	SW3550	p,p'-DDD	2.3	JP	2.3	J	0.42	11.0	ug/Kg	2C
SB	NDA114	N	SW8081	SW3550	p,p'-DDD	12	=	12	J	0.30	4.3	ug/Kg	2C
SS	NDA113	N	SW8081	SW3550	p,p'-DDD	1.2	J	4.1	UJ	0.28	4.1	ug/Kg	2C
SB	NDA112	N	SW8081	SW3550	p,p'-DDD	0.32	J	0.32	J	0.30	4.3	ug/Kg	2C
SS	NDA109	N	SW8081	SW3550	p,p'-DDD	0.62	J	0.62	J	0.30	4.3	ug/Kg	2C
SS	NDA111	N	SW8081	SW3550	p,p'-DDD	2	J	2	J	0.30	4.4	ug/Kg	2C
SB	NDA102	N	SW8081	SW3550	p,p'-DDD	13	=	13	J	0.36	5.2	ug/Kg	2C
SS	NDW06SS22-R01	N	SW8081	SW3550	p,p'-DDE	0.37	JP	0.37	J	0.070	4.3	ug/Kg	2C
SD	NDW06SD11-R01	N	SW8081	SW3550	p,p'-DDE	1.5	JP	1.5	J	0.073	4.5	ug/Kg	2C
SS	NDW06SS12-R01	N	SW8081	SW3550	p,p'-DDE	2.8	JP	2.8	J	0.078	4.8	ug/Kg	2C
SD	NDW06SD02-R01	N	SW8081	SW3550	p,p'-DDE	4.9	JP	4.9	U	0.080	4.9	ug/Kg	2C
SS	NDW06SS18-R01	N	SW8081	SW3550	p,p'-DDE	0.23	JP	5.7	U	0.094	5.7	ug/Kg	2C
SS	NDW06SS23-R01	N	SW8081	SW3550	p,p'-DDE	18	JP	18	J	0.72	44.0	ug/Kg	2C
SD	NDW06SD08-R01	N	SW8081	SW3550	p,p'-DDT	1.7	JP	11	U	0.61	11.0	ug/Kg	2C
SB	NDA108	N	SW8081	SW3550	p,p'-DDT	1.8	J	1.8	J	0.52	4.4	ug/Kg	2C
SB	NDA102	N	SW8081	SW3550	p,p'-DDT	2.2	J	5.2	UJ	0.61	5.2	ug/Kg	2C
SS	NDA103	N	SW8081	SW3550	p,p'-DDT	1.5	J	4.5	UJ	0.53	4.5	ug/Kg	2C, FD
SD	NDW06FD03P-R01	FD	SW8260B	SW5030	Acetone	91.8	=	91.8	UJ	5.4	14.5	ug/Kg	BL
SS	NDW06SS23-R01	N	SW8260B	SW5030	Acetone	11.1	J	11.1	UJ	4.1	11.1	ug/Kg	BL
SD	NDW06SD13-R01	N	SW8260B	SW5030	Acetone	58.7	=	58.7	UJ	5.0	13.4	ug/Kg	BL
SD	NDW06SD11-R01	N	SW8260B	SW5030	Acetone	114	=	114	UJ	5.2	14.0	ug/Kg	BL
SD	NDW06SD12-R01	N	SW8260B	SW5030	Acetone	86.1	=	86.1	U	5.5	14.9	ug/Kg	BL
SD	NDW06SD09-R01	N	SW8260B	SW5030	Acetone	41.2	=	41.2	U	13.7	37.1	ug/Kg	BL
SD	NDW06SD06-R01	N	SW8260B	SW5030	Acetone	439	=	439	U	17.3	46.7	ug/Kg	BL
SD	NDW06SD05-R01	N	SW8260B	SW5030	Acetone	126	=	126	UJ	19.4	52.6	ug/Kg	BL
SD	NDW06SD07-R01	N	SW8260B	SW5030	Acetone	68.2	=	68.2	U	22.1	59.7	ug/Kg	BL
WG	NDW06GW01-R01	N	SW8260B	SW5030	Acetone	5.5	=	5.5	U	1.9	5.0	ug/L	BL
WG	NDW06GW07-R01	N	SW8260B	SW5030	Acetone	62.3	=	62.3	U	1.9	5.0	ug/L	BL
WS	NDW06SW02-R01	N	SW8260B	SW5030	Acetone	2.2	J	5	U	1.9	5.0	ug/L	BL
WS	NDW06SW03-R01	N	SW8260B	SW5030	Acetone	3.9	J	5	U	1.9	5.0	ug/L	BL
WS	NDW06SW06-R01	N	SW8260B	SW5030	Acetone	2.6	J	5	U	1.9	5.0	ug/L	BL
WS	NDW06SW07-R01	N	SW8260B	SW5030	Acetone	2.6	J	5	U	1.9	5.0	ug/L	BL
WS	NDW06SW08-R01	N	SW8260B	SW5030	Acetone	2.9	J	5	U	1.9	5.0	ug/L	BL
WS	NDW06SW10K-R01	N	SW8260B	SW5030	Acetone	5.7	=	5.7	U	1.9	5.0	ug/L	BL
WS	NDW06SW11K-R01	N	SW8260B	SW5030	Acetone	6.2	=	6.2	U	1.9	5.0	ug/L	BL
SB	NDA110	N	SW8260B	SW5030	m,p-Xylene (sum of isomers)	0.3	J	11	U	0.24	11.0	ug/Kg	BL
SS	NDA109	N	SW8260B	SW5030	m,p-Xylene (sum of isomers)	0.4	J	11	U	0.25	11.0	ug/Kg	BL
SS	NDA107	N	SW8260B	SW5030	m,p-Xylene (sum of isomers)	0.3	J	12	U	0.26	12.0	ug/Kg	BL
SS	NDA103	N	SW8260B	SW5030	m,p-Xylene (sum of isomers)	0.3	J	13	U	0.28	13.0	ug/Kg	BL

EXHIBIT 4
Change in Qualifier Through the Data Validation Process

Matrix	Sample ID	Sample Type	Analytical Method	Prep Method	Parameter	Lab Result	Lab Qual	Final Result	Final Qual	DL	RL	Units	DV Notes
SB	NDA105	N	SW8260B	SW5030	m,p-Xylene (sum of isomers)	6	J	17	U	0.37	17.0	ug/Kg	BL
SB	NDA095FD1	FD	SW8260B	SW5030	Methylene chloride	3	J	10	U	2.0	10.0	ug/Kg	BL
SB	NDA093	N	SW8260B	SW5030	Methylene chloride	2	U	10	U	2.0	10.0	ug/Kg	BL
SB	NDA094	N	SW8260B	SW5030	Methylene chloride	3	J	12	U	2.0	12.0	ug/Kg	BL
SB	NDA095FD1	FD	SW8260B	SW5030	Toluene	0.4	J	10	U	0.27	10.0	ug/Kg	BL
WG	NDW06FD01P-R01	FD	SW8260B	SW5030	Toluene	1	B	1	U	0.19	0.50	ug/L	BL
SB	NDA093	N	SW8260B	SW5030	Toluene	0.3	J	10	U	0.26	10.0	ug/Kg	BL
SB	NDA094	N	SW8260B	SW5030	Toluene	0.5	J	12	U	0.32	12.0	ug/Kg	BL
WG	NDW06GW01-R01	N	SW8260B	SW5030	Toluene	0.8	B	0.8	U	0.19	0.50	ug/L	BL
WG	NDW06GW02-R01	N	SW8260B	SW5030	Toluene	0.92	B	0.92	U	0.19	0.50	ug/L	BL
WG	NDW06GW03-R01	N	SW8260B	SW5030	Toluene	0.94	B	0.94	U	0.19	0.50	ug/L	BL
WG	NDW06GW05-R01	N	SW8260B	SW5030	Toluene	1.4	B	1.4	U	0.19	0.50	ug/L	BL
WG	NDW06GW06-R01	N	SW8260B	SW5030	Toluene	1	B	1	U	0.19	0.50	ug/L	BL
WG	NDW06GW04-R01	N	SW8260B	SW5030	Toluene	0.22	J	0.5	U	0.19	0.50	ug/L	BL
WG	NDW06GW07-R01	N	SW8260B	SW5030	Toluene	0.46	J	0.5	U	0.19	0.50	ug/L	BL
WG	NDW06GW08-R01	N	SW8260B	SW5030	Toluene	0.37	J	0.5	U	0.19	0.50	ug/L	BL
SB	NDA110	N	SW8260B	SW5030	Xylenes, total	0.3	J	11	U	0.24	11.0	ug/Kg	BL
SS	NDA109	N	SW8260B	SW5030	Xylenes, total	0.4	J	11	U	0.25	11.0	ug/Kg	BL
SS	NDA107	N	SW8260B	SW5030	Xylenes, total	0.3	J	12	U	0.26	12.0	ug/Kg	BL
SS	NDA103	N	SW8260B	SW5030	Xylenes, total	0.3	J	13	U	0.28	13.0	ug/Kg	BL
SB	NDA105	N	SW8260B	SW5030	Xylenes, total	7	J	17	U	0.37	17.0	ug/Kg	BL
SS	NDW06FD04P-R01	FD	SW8270C	SW3550	bis(2-Ethylhexyl) phthalate	424	JB	424	U	39.8	424	ug/Kg	BL
SD	NDW06SD10-R01	N	SW8270C	SW3550	bis(2-Ethylhexyl) phthalate	190	JB	408	U	38.3	408	ug/Kg	BL
SS	NDW06SS13-R01	N	SW8270C	SW3550	bis(2-Ethylhexyl) phthalate	416	J	416	U	39.1	416	ug/Kg	BL
SS	NDW06SS11-R01	N	SW8270C	SW3550	bis(2-Ethylhexyl) phthalate	430	JB	430	U	40.4	430	ug/Kg	BL
SS	NDW06SS22-R01	N	SW8270C	SW3550	bis(2-Ethylhexyl) phthalate	430	JB	430	U	40.4	430	ug/Kg	BL
SS	NDW06SS23-R01	N	SW8270C	SW3550	bis(2-Ethylhexyl) phthalate	434	JB	434	U	40.7	434	ug/Kg	BL
SS	NDW06SS10-R01	N	SW8270C	SW3550	bis(2-Ethylhexyl) phthalate	435	JB	435	U	40.8	435	ug/Kg	BL
SS	NDW06SS09-R01	N	SW8270C	SW3550	bis(2-Ethylhexyl) phthalate	118	JB	441	U	41.4	441	ug/Kg	BL
SS	NDW06SS12-R01	N	SW8270C	SW3550	bis(2-Ethylhexyl) phthalate	479	JB	479	U	45.0	479	ug/Kg	BL
SD	NDW06SD12-R01	N	SW8270C	SW3550	bis(2-Ethylhexyl) phthalate	512	JB	512	U	48.1	512	ug/Kg	BL
SS	NDW06SS18-R01	N	SW8270C	SW3550	bis(2-Ethylhexyl) phthalate	569	JB	569	U	53.4	569	ug/Kg	BL
SS	NDW06SS16-R01	N	SW8270C	SW3550	bis(2-Ethylhexyl) phthalate	575	JB	575	U	54.0	575	ug/Kg	BL
SS	NDW06SS15-R01	N	SW8270C	SW3550	bis(2-Ethylhexyl) phthalate	597	JB	597	U	56.1	597	ug/Kg	BL
SD	NDW06SD06-R01	N	SW8270C	SW3550	bis(2-Ethylhexyl) phthalate	332	JB	793	U	74.5	793	ug/Kg	BL
SD	NDW06SD15K-R01	N	SW8270C	SW3550	bis(2-Ethylhexyl) phthalate	279	JB	800	U	75.1	800	ug/Kg	BL
SD	NDW06SD16K-R01	N	SW8270C	SW3550	bis(2-Ethylhexyl) phthalate	219	JB	816	U	76.6	816	ug/Kg	BL
SD	NDW06SD08-R01	N	SW8270C	SW3550	bis(2-Ethylhexyl) phthalate	1060	JB	1060	U	99.5	1060	ug/Kg	BL
WG	NDA012	N	SW8270C	SW3510	bis(2-Ethylhexyl) phthalate	1	J	5	U	0.90	5.0	ug/L	BL
WG	NDA005	N	SW8270C	SW3510	bis(2-Ethylhexyl) phthalate	4	J	6	U	1.0	6.0	ug/L	BL
WG	NDA006	N	SW8270C	SW3510	bis(2-Ethylhexyl) phthalate	3	J	6	U	1.0	6.0	ug/L	BL
WG	NDA008	N	SW8270C	SW3510	bis(2-Ethylhexyl) phthalate	4	J	6	U	1.0	6.0	ug/L	BL
WG	NDA009	N	SW8270C	SW3510	bis(2-Ethylhexyl) phthalate	2	J	6	U	1.0	6.0	ug/L	BL
WG	NDA010	N	SW8270C	SW3510	bis(2-Ethylhexyl) phthalate	3	J	6	U	1.0	6.0	ug/L	BL
WG	NDW06GW07-R01	N	SW8270C	SW3510	bis(2-Ethylhexyl) phthalate	7.4	J	10.2	U	6.1	10.2	ug/L	BL

EXHIBIT 4
Change in Qualifier Through the Data Validation Process

Matrix	Sample ID	Sample Type	Analytical Method	Prep Method	Parameter	Lab Result	Lab Qual	Final Result	Final Qual	DL	RL	Units	DV Notes
SD	NDW06FD03P-R01	FD	SW8270C	SW3550	Diethyl phthalate	186	J	448	U	27.1	448	ug/Kg	BL
SD	NDW06SD13-R01	N	SW8270C	SW3550	Diethyl phthalate	279	J	433	U	26.3	433	ug/Kg	BL
SD	NDW06SD02-R01	N	SW8270C	SW3550	Diethyl phthalate	223	J	490	U	29.7	490	ug/Kg	BL
SD	NDW06SD14-R01	N	SW8270C	SW3550	Diethyl phthalate	311	J	500	U	30.3	500	ug/Kg	BL
WG	NDW06GW02-R01	N	SW8270C	SW3510	Di-n-butyl phthalate	0.57	J	5.2	U	0.27	5.2	ug/L	BL
SB	NDA106FD1	FD	SW8260B	SW5030	Acetone	21	=	21	R	16.0	16.0	ug/Kg	CC
SB	NDA112	N	SW8260B	SW5030	Acetone	12	=	12	R	11.0	11.0	ug/Kg	CC
SB	NDA108	N	SW8260B	SW5030	Acetone	18	=	18	R	13.0	13.0	ug/Kg	CC
SS	NDA103	N	SW8260B	SW5030	Acetone	25	=	25	R	13.0	13.0	ug/Kg	CC
SB	NDA105	N	SW8260B	SW5030	Acetone	22	=	22	R	17.0	17.0	ug/Kg	CC
SD	NDA303	N	SW8260B	SW5030	Acetone	100	=	100	R	47.0	47.0	ug/Kg	CC
WG	NDW06GW01-R01	N	SW8270C	SW3510	caprolactam	37.4	=	37.4	J	0.30	5.1	ug/L	BS
WG	NDW06GW03-R01	N	SW8270C	SW3510	caprolactam	1.3	J	1.3	J	0.30	5.1	ug/L	BS
WG	NDW06GW08-R01	N	SW8270C	SW3510	Di-n-octylphthalate	8.1	=	8.1	J	3.1	5.1	ug/L	BS
WG	NDW06GW04-R01	N	SW8270C	SW3510	Di-n-octylphthalate	4.9	J	4.9	J	3.1	5.2	ug/L	BS
WS	NDW06FD02P-R01	FD	SW8260B	SW5030	1,2,3-trichlorobenzene	0.5	U	0.5	R	0.14	0.50	ug/L	BS
WS	NDW06SW02-R01	N	SW8260B	SW5030	1,2,3-trichlorobenzene	0.5	U	0.5	R	0.14	0.50	ug/L	BS
WS	NDW06SW03-R01	N	SW8260B	SW5030	1,2,3-trichlorobenzene	0.5	U	0.5	R	0.14	0.50	ug/L	BS
WS	NDW06SW05-R01	N	SW8260B	SW5030	1,2,3-trichlorobenzene	0.5	U	0.5	R	0.14	0.50	ug/L	BS
WS	NDW06SW06-R01	N	SW8260B	SW5030	1,2,3-trichlorobenzene	0.5	U	0.5	R	0.14	0.50	ug/L	BS
WS	NDW06SW07-R01	N	SW8260B	SW5030	1,2,3-trichlorobenzene	0.5	U	0.5	R	0.14	0.50	ug/L	BS
WS	NDW06SW08-R01	N	SW8260B	SW5030	1,2,3-trichlorobenzene	0.5	U	0.5	R	0.14	0.50	ug/L	BS
WS	NDW06SW09-R01	N	SW8260B	SW5030	1,2,3-trichlorobenzene	0.5	U	0.5	R	0.14	0.50	ug/L	BS
WS	NDW06SW10K-R01	N	SW8260B	SW5030	1,2,3-trichlorobenzene	0.5	U	0.5	R	0.14	0.50	ug/L	BS
WS	NDW06SW11K-R01	N	SW8260B	SW5030	1,2,3-trichlorobenzene	0.5	U	0.5	R	0.14	0.50	ug/L	BS
WG	NDW06GW04-R01	N	SW8260B	SW5030	1,2-Dibromo-3-chloropropane	2	U	2	R	0.78	2.0	ug/L	BS
WG	NDW06GW07-R01	N	SW6260B	SW5030	1,2-Dibromo-3-chloropropane	2	U	2	R	0.78	2.0	ug/L	BS
WG	NDW06GW08-R01	N	SW8260B	SW5030	1,2-Dibromo-3-chloropropane	2	U	2	R	0.78	2.0	ug/L	BS
WG	NDW06GW04-R01	N	SW8260B	SW5030	1,2-Dichlorobenzene	0.5	U	0.5	R	0.18	0.50	ug/L	BS
WG	NDW06GW07-R01	N	SW8260B	SW5030	1,2-Dichlorobenzene	0.5	U	0.5	R	0.18	0.50	ug/L	BS
WG	NDW06GW08-R01	N	SW8260B	SW5030	1,2-Dichlorobenzene	0.5	U	0.5	R	0.18	0.50	ug/L	BS
WS	NDW06FD02P-R01	FD	SW8260B	SW5030	Isopropylbenzene (Cumene)	0.5	U	0.5	R	0.18	0.50	ug/L	BS
WG	NDW06GW04-R01	N	SW8260B	SW5030	Isopropylbenzene (Cumene)	0.5	U	0.5	R	0.18	0.50	ug/L	BS
WG	NDW06GW07-R01	N	SW8260B	SW5030	Isopropylbenzene (Cumene)	0.5	U	0.5	R	0.18	0.50	ug/L	BS
WG	NDW06GW08-R01	N	SW8260B	SW5030	Isopropylbenzene (Cumene)	0.5	U	0.5	R	0.18	0.50	ug/L	BS
WS	NDW06SW02-R01	N	SW8260B	SW5030	Isopropylbenzene (Cumene)	0.5	U	0.5	R	0.18	0.50	ug/L	BS
WS	NDW06SW03-R01	N	SW8260B	SW5030	Isopropylbenzene (Cumene)	0.5	U	0.5	R	0.18	0.50	ug/L	BS
WS	NDW06SW05-R01	N	SW8260B	SW5030	Isopropylbenzene (Cumene)	0.5	U	0.5	R	0.18	0.50	ug/L	BS
WS	NDW06SW06-R01	N	SW8260B	SW5030	Isopropylbenzene (Cumene)	0.5	U	0.5	R	0.18	0.50	ug/L	BS
WS	NDW06SW07-R01	N	SW8260B	SW5030	Isopropylbenzene (Cumene)	0.5	U	0.5	R	0.18	0.50	ug/L	BS
WS	NDW06SW08-R01	N	SW8260B	SW5030	Isopropylbenzene (Cumene)	0.5	U	0.5	R	0.18	0.50	ug/L	BS
WS	NDW06SW09-R01	N	SW8260B	SW5030	Isopropylbenzene (Cumene)	0.5	U	0.5	R	0.18	0.50	ug/L	BS
WS	NDW06SW10K-R01	N	SW8260B	SW5030	Isopropylbenzene (Cumene)	0.5	U	0.5	R	0.18	0.50	ug/L	BS
WS	NDW06SW11K-R01	N	SW8260B	SW5030	Isopropylbenzene (Cumene)	0.5	U	0.5	R	0.18	0.50	ug/L	BS
WS	NDW06SW03-R01	N	SW8270C	SW3510	1,2,4,5-tetrachlorobenzene	10.3	U	10.3	R	2.5	10.3	ug/L	BS

EXHIBIT 4
Change in Qualifier Through the Data Validation Process

Matrix	Sample ID	Sample Type	Analytical Method	Prep Method	Parameter	Lab Result	Lab Qual	Final Result	Final Qual	DL	RL	Units	DV Notes
SD	NDW06SD10-R01	N	SW8270C	SW3550	2,4,6-Trichlorophenol	408	U	408	R	48.2	408	ug/Kg	BS
SD	NDW06SD12-R01	N	SW8270C	SW3550	2,4,6-Trichlorophenol	512	U	512	R	60.5	512	ug/Kg	BS
SD	NDW06SD06-R01	N	SW8270C	SW3550	2,4,6-Trichlorophenol	793	U	793	R	93.7	793	ug/Kg	BS
SD	NDW06SD15K-R01	N	SW8270C	SW3550	2,4,6-Trichlorophenol	800	U	800	R	94.5	800	ug/Kg	BS
SD	NDW06SD16K-R01	N	SW8270C	SW3550	2,4,6-Trichlorophenol	816	U	816	R	96.4	816	ug/Kg	BS
SD	NDW06SD09-R01	N	SW8270C	SW3550	2,4,6-Trichlorophenol	880	U	880	R	104	880	ug/Kg	BS
SD	NDW06SD07-R01	N	SW8270C	SW3550	2,4,6-Trichlorophenol	1050	U	1050	R	124	1050	ug/Kg	BS
SD	NDW06SD08-R01	N	SW8270C	SW3550	2,4,6-Trichlorophenol	1060	U	1060	R	125	1060	ug/Kg	BS
SD	NDW06FD03P-R01	FD	SW8270C	SW3550	4-Chloroaniline	448	U	448	R	33.9	448	ug/Kg	BS
SD	NDW06SD13-R01	N	SW8270C	SW3550	4-Chloroaniline	433	U	433	R	32.8	433	ug/Kg	BS
SD	NDW06SD11-R01	N	SW8270C	SW3550	4-Chloroaniline	444	U	444	R	33.7	444	ug/Kg	BS
SD	NDW06SD02-R01	N	SW8270C	SW3550	4-Chloroaniline	490	U	490	R	37.1	490	ug/Kg	BS
SD	NDW06SD14-R01	N	SW8270C	SW3550	4-Chloroaniline	500	U	500	R	37.9	500	ug/Kg	BS
SD	NDW06SD03-R01	N	SW8270C	SW3550	4-Chloroaniline	763	U	763	R	57.8	763	ug/Kg	BS
SD	NDW06SD05-R01	N	SW8270C	SW3550	4-Chloroaniline	1040	U	1040	R	78.5	1040	ug/Kg	BS
SD	NDW06SD15K-R01	N	SW8270C	SW3550	Acetophenone	800	U	800	R	75.1	800	ug/Kg	BS
SD	NDW06SD16K-R01	N	SW8270C	SW3550	Acetophenone	816	U	816	R	76.6	816	ug/Kg	BS
SD	NDW06FD03P-R01	FD	SW8270C	SW3550	Benzaldehyde	448	U	448	R	65.1	448	ug/Kg	BS
SD	NDW06SD10-R01	N	SW8270C	SW3550	Benzaldehyde	408	U	408	R	59.3	408	ug/Kg	BS
SD	NDW06SD13-R01	N	SW8270C	SW3550	Benzaldehyde	433	U	433	R	63.0	433	ug/Kg	BS
SD	NDW06SD11-R01	N	SW8270C	SW3550	Benzaldehyde	444	U	444	R	64.6	444	ug/Kg	BS
SD	NDW06SD02-R01	N	SW8270C	SW3550	Benzaldehyde	490	U	490	R	71.3	490	ug/Kg	BS
SD	NDW06SD14-R01	N	SW8270C	SW3550	Benzaldehyde	500	U	500	R	72.8	500	ug/Kg	BS
SD	NDW06SD12-R01	N	SW8270C	SW3550	Benzaldehyde	512	U	512	R	74.5	512	ug/Kg	BS
SD	NDW06SD03-R01	N	SW8270C	SW3550	Benzaldehyde	763	U	763	R	111	763	ug/Kg	BS
SD	NDW06SD06-R01	N	SW8270C	SW3550	Benzaldehyde	793	U	793	R	115	793	ug/Kg	BS
SD	NDW06SD15K-R01	N	SW8270C	SW3550	Benzaldehyde	800	U	800	R	116	800	ug/Kg	BS
SD	NDW06SD16K-R01	N	SW8270C	SW3550	Benzaldehyde	816	U	816	R	119	816	ug/Kg	BS
SD	NDW06SD09-R01	N	SW8270C	SW3550	Benzaldehyde	880	U	880	R	128	880	ug/Kg	BS
SD	NDW06SD05-R01	N	SW8270C	SW3550	Benzaldehyde	1040	U	1040	R	151	1040	ug/Kg	BS
SD	NDW06SD07-R01	N	SW8270C	SW3550	Benzaldehyde	1050	U	1050	R	152	1050	ug/Kg	BS
SD	NDW06SD08-R01	N	SW8270C	SW3550	Benzaldehyde	1060	U	1060	R	154	1060	ug/Kg	BS
SD	NDW06SD10-R01	N	SW8270C	SW3550	Bis(2-Chloroethoxy) methane	408	U	408	R	32.1	408	ug/Kg	BS
SD	NDW06SD12-R01	N	SW8270C	SW3550	Bis(2-Chloroethoxy) methane	512	U	512	R	40.3	512	ug/Kg	BS
SD	NDW06SD06-R01	N	SW8270C	SW3550	Bis(2-Chloroethoxy) methane	793	U	793	R	62.5	793	ug/Kg	BS
SD	NDW06SD15K-R01	N	SW8270C	SW3550	Bis(2-Chloroethoxy) methane	800	U	800	R	63.0	800	ug/Kg	BS
SD	NDW06SD16K-R01	N	SW8270C	SW3550	Bis(2-Chloroethoxy) methane	816	U	816	R	64.2	816	ug/Kg	BS
SD	NDW06SD09-R01	N	SW8270C	SW3550	Bis(2-Chloroethoxy) methane	880	U	880	R	69.3	880	ug/Kg	BS
SD	NDW06SD07-R01	N	SW8270C	SW3550	Bis(2-Chloroethoxy) methane	1050	U	1050	R	82.5	1050	ug/Kg	BS
SD	NDW06SD08-R01	N	SW8270C	SW3550	Bis(2-Chloroethoxy) methane	1060	U	1060	R	83.5	1060	ug/Kg	BS
WG	NDW06FD01P-R01	FD	SW8270C	SW3510	caprolactam	5.1	U	5.1	R	0.30	5.1	ug/L	BS
WS	NDW06FD02P-R01	FD	SW8270C	SW3510	caprolactam	5.4	U	5.4	R	0.32	5.4	ug/L	BS
WS	NDW06SW05-R01	N	SW8270C	SW3510	caprolactam	5	U	5	R	0.30	5.0	ug/L	BS
WS	NDW06SW06-R01	N	SW8270C	SW3510	caprolactam	5	U	5	R	0.30	5.0	ug/L	BS
WS	NDW06SW07-R01	N	SW8270C	SW3510	caprolactam	5	U	5	R	0.30	5.0	ug/L	BS

EXHIBIT 4
Change in Qualifier Through the Data Validation Process

Matrix	Sample ID	Sample Type	Analytical Method	Prep Method	Parameter	Lab Result	Lab Qual	Final Result	Final Qual	DL	RL	Units	DV Notes
WS	NDW06SW08-R01	N	SW8270C	SW3510	caprolactam	5	U	5	R	0.30	5.0	ug/L	BS
WS	NDW06SW10K-R01	N	SW8270C	SW3510	caprolactam	5	U	5	R	0.30	5.0	ug/L	BS
WG	NDW06GW07-R01	N	SW8270C	SW3510	caprolactam	5.1	U	5.1	R	0.30	5.1	ug/L	BS
WG	NDW06GW08-R01	N	SW8270C	SW3510	caprolactam	5.1	U	5.1	R	0.30	5.1	ug/L	BS
WG	NDW06GW04-R01	N	SW8270C	SW3510	caprolactam	5.2	U	5.2	R	0.30	5.2	ug/L	BS
WS	NDW06SW11K-R01	N	SW8270C	SW3510	caprolactam	5.2	U	5.2	R	0.30	5.2	ug/L	BS
WG	NDW06GW02-R01	N	SW8270C	SW3510	caprolactam	5.2	U	5.2	R	0.31	5.2	ug/L	BS
WG	NDW06GW06-R01	N	SW8270C	SW3510	caprolactam	5.2	U	5.2	R	0.31	5.2	ug/L	BS
WS	NDW06SW09-R01	N	SW8270C	SW3510	caprolactam	5.2	U	5.2	R	0.31	5.2	ug/L	BS
WG	NDW06GW05-R01	N	SW8270C	SW3510	caprolactam	5.3	U	5.3	R	0.31	5.3	ug/L	BS
WS	NDW06SW02-R01	N	SW8270C	SW3510	caprolactam	5.3	U	5.3	R	0.31	5.3	ug/L	BS
WS	NDW06SW03-R01	N	SW8270C	SW3510	caprolactam	10.3	U	10.3	R	0.61	10.3	ug/L	BS
SD	NDW06SD10-R01	N	SW8270C	SW3550	Hexachloroethane	408	U	408	R	43.2	408	ug/Kg	BS
SD	NDW06SD12-R01	N	SW8270C	SW3550	Hexachloroethane	512	U	512	R	54.3	512	ug/Kg	BS
SD	NDW06SD06-R01	N	SW8270C	SW3550	Hexachloroethane	793	U	793	R	84.1	793	ug/Kg	BS
SD	NDW06SD15K-R01	N	SW8270C	SW3550	Hexachloroethane	800	U	800	R	84.8	800	ug/Kg	BS
SD	NDW06SD16K-R01	N	SW8270C	SW3550	Hexachloroethane	816	U	816	R	86.5	816	ug/Kg	BS
SD	NDW06SD09-R01	N	SW8270C	SW3550	Hexachloroethane	880	U	880	R	93.3	880	ug/Kg	BS
SD	NDW06SD07-R01	N	SW8270C	SW3550	Hexachloroethane	1050	U	1050	R	111	1050	ug/Kg	BS
SD	NDW06SD08-R01	N	SW8270C	SW3550	Hexachloroethane	1060	U	1060	R	112	1060	ug/Kg	BS
SD	NDW06SD10-R01	N	SW8270C	SW3550	Naphthalene	408	U	408	R	35.8	408	ug/Kg	BS
SD	NDW06SD12-R01	N	SW8270C	SW3550	Naphthalene	512	U	512	R	45.0	512	ug/Kg	BS
SD	NDW06SD06-R01	N	SW8270C	SW3550	Naphthalene	793	U	793	R	69.7	793	ug/Kg	BS
SD	NDW06SD15K-R01	N	SW8270C	SW3550	Naphthalene	800	U	800	R	70.3	800	ug/Kg	BS
SD	NDW06SD16K-R01	N	SW8270C	SW3550	Naphthalene	816	U	816	R	71.7	816	ug/Kg	BS
SD	NDW06SD09-R01	N	SW8270C	SW3550	Naphthalene	880	U	880	R	77.3	880	ug/Kg	BS
SD	NDW06SD07-R01	N	SW8270C	SW3550	Naphthalene	1050	U	1050	R	92.0	1050	ug/Kg	BS
SD	NDW06SD08-R01	N	SW8270C	SW3550	Naphthalene	1060	U	1060	R	93.1	1060	ug/Kg	BS
SD	NDW06SD15K-R01	N	SW8270C	SW3550	Pentachlorophenol	2400	U	2400	R	75.1	2400	ug/Kg	BS
SD	NDW06SD16K-R01	N	SW8270C	SW3550	Pentachlorophenol	2450	U	2450	R	76.6	2450	ug/Kg	BS
SD	NDW06SD05-R01DL1	LR	SW8081	SW3550	Aldrin	54	U	54	UJ	3.2	54.0	ug/Kg	BS
SD	NDW06SD13-R01	N	SW8081	SW3550	Aldrin	2.2	U	2.2	UJ	0.13	2.2	ug/Kg	BS
SD	NDW06SD11-R01	N	SW8081	SW3550	Aldrin	2.3	U	2.3	UJ	0.14	2.3	ug/Kg	BS
SD	NDW06SD02-R01	N	SW8081	SW3550	Aldrin	2.5	U	2.5	UJ	0.15	2.5	ug/Kg	BS
SD	NDW06SD03-R01	N	SW8081	SW3550	Aldrin	3.9	U	3.9	UJ	0.23	3.9	ug/Kg	BS
SS	NDW06FD04P-R01	FD	SW8081	SW3550	alpha bhc	2.2	U	2.2	UJ	0.14	2.2	ug/Kg	BS
SD	NDW06SD05-R01DL1	LR	SW8081	SW3550	alpha bhc	54	U	54	UJ	3.5	54.0	ug/Kg	BS
SD	NDW06SD13-R01	N	SW8081	SW3550	alpha bhc	2.2	U	2.2	UJ	0.14	2.2	ug/Kg	BS
SS	NDW06SS13-R01	N	SW8081	SW3550	alpha bhc	2.2	U	2.2	UJ	0.14	2.2	ug/Kg	BS
SS	NDW06SS22-R01	N	SW8081	SW3550	alpha bhc	2.2	U	2.2	UJ	0.14	2.2	ug/Kg	BS
SD	NDW06SD11-R01	N	SW8081	SW3550	alpha bhc	2.3	U	2.3	UJ	0.15	2.3	ug/Kg	BS
SS	NDW06SS09-R01	N	SW8081	SW3550	alpha bhc	2.3	U	2.3	UJ	0.15	2.3	ug/Kg	BS
SS	NDW06SS10-R01	N	SW8081	SW3550	alpha bhc	2.3	U	2.3	UJ	0.15	2.3	ug/Kg	BS
SS	NDW06SS12-R01	N	SW8081	SW3550	alpha bhc	2.4	U	2.4	UJ	0.16	2.4	ug/Kg	BS
SD	NDW06SD02-R01	N	SW8081	SW3550	alpha bhc	2.5	U	2.5	UJ	0.16	2.5	ug/Kg	BS

EXHIBIT 4
Change in Qualifier Through the Data Validation Process

Matrix	Sample ID	Sample Type	Analytical Method	Prep Method	Parameter	Lab Result	Lab Qual	Final Result	Final Qual	DL	RL	Units	DV Notes
SS	NDW06SS18-R01	N	SW8081	SW3550	alpha bhc	2.9	U	2.9	UJ	0.19	2.9	ug/Kg	BS
SS	NDW06SS14-R01	N	SW8081	SW3550	alpha bhc	3	U	3	UJ	0.19	3.0	ug/Kg	BS
SS	NDW06SS15-R01	N	SW8081	SW3550	alpha bhc	3.1	U	3.1	UJ	0.20	3.1	ug/Kg	BS
SD	NDW06SD03-R01	N	SW8081	SW3550	alpha bhc	3.9	U	3.9	UJ	0.25	3.9	ug/Kg	BS
SS	NDW06SS21-R01	N	SW8081	SW3550	alpha bhc	22	U	22	UJ	1.4	22.0	ug/Kg	BS
SS	NDW06SS23-R01	N	SW8081	SW3550	alpha bhc	23	U	23	UJ	1.5	23.0	ug/Kg	BS
SS	NDW06SS20-R01	N	SW8081	SW3550	alpha bhc	25	U	25	UJ	1.6	25.0	ug/Kg	BS
SS	NDW06SS19-R01	N	SW8081	SW3550	alpha bhc	29	U	29	UJ	1.9	29.0	ug/Kg	BS
SS	NDW06FD04P-R01	FD	SW8081	SW3550	toxaphene	220	U	220	UJ	0.73	220	ug/Kg	BS
WG	NDW06FD01P-R01	FD	SW8081	SW3510	toxaphene	0.051	U	0.051	UJ	0.031	0.051	ug/L	BS
SD	NDW06SD05-R01DL1	LR	SW8081	SW3550	toxaphene	5400	U	5400	UJ	18.0	5400	ug/Kg	BS
WG	NDW06GW05-R01DL	LR	SW8081	SW3510	toxaphene	0.5	U	0.5	UJ	0.31	0.50	ug/L	BS
SS	NDW06SS13-R01	N	SW8081	SW3550	toxaphene	220	U	220	UJ	0.71	220	ug/Kg	BS
SS	NDW06SS22-R01	N	SW8081	SW3550	toxaphene	220	U	220	UJ	0.73	220	ug/Kg	BS
SD	NDW06SD13-R01	N	SW8081	SW3550	toxaphene	220	U	220	UJ	0.74	220	ug/Kg	BS
SS	NDW06SS10-R01	N	SW8081	SW3550	toxaphene	230	U	230	UJ	0.74	230	ug/Kg	BS
SS	NDW06SS09-R01	N	SW8081	SW3550	toxaphene	230	U	230	UJ	0.75	230	ug/Kg	BS
SD	NDW06SD11-R01	N	SW8081	SW3550	toxaphene	230	U	230	UJ	0.76	230	ug/Kg	BS
SS	NDW06SS12-R01	N	SW8081	SW3550	toxaphene	240	U	240	UJ	0.81	240	ug/Kg	BS
SD	NDW06SD02-R01	N	SW8081	SW3550	toxaphene	250	U	250	UJ	0.83	250	ug/Kg	BS
SS	NDW06SS18-R01	N	SW8081	SW3550	toxaphene	290	U	290	UJ	0.97	290	ug/Kg	BS
SS	NDW06SS14-R01	N	SW8081	SW3550	toxaphene	300	U	300	UJ	0.99	300	ug/Kg	BS
SS	NDW06SS15-R01	N	SW8081	SW3550	toxaphene	310	U	310	UJ	1.0	310	ug/Kg	BS
SD	NDW06SD03-R01	N	SW8081	SW3550	toxaphene	390	U	390	UJ	1.3	390	ug/Kg	BS
SD	NDW06SD15K-R01	N	SW8081	SW3550	toxaphene	410	U	410	UJ	1.4	410	ug/Kg	BS
SS	NDW06SS21-R01	N	SW8081	SW3550	toxaphene	2200	U	2200	UJ	7.4	2200	ug/Kg	BS
SS	NDW06SS23-R01	N	SW8081	SW3550	toxaphene	2300	U	2300	UJ	7.4	2300	ug/Kg	BS
SS	NDW06SS20-R01	N	SW8081	SW3550	toxaphene	2500	U	2500	UJ	8.1	2500	ug/Kg	BS
SS	NDW06SS19-R01	N	SW8081	SW3550	toxaphene	2900	U	2900	UJ	9.5	2900	ug/Kg	BS
WG	NDW06GW01-R01	N	SW8081	SW3510	toxaphene	0.05	U	0.05	UJ	0.031	0.050	ug/L	BS
WG	NDW06GW02-R01	N	SW8081	SW3510	toxaphene	0.05	U	0.05	UJ	0.031	0.050	ug/L	BS
WG	NDW06GW03-R01	N	SW8081	SW3510	toxaphene	0.05	U	0.05	UJ	0.031	0.050	ug/L	BS
WG	NDW06GW06-R01	N	SW8081	SW3510	toxaphene	0.051	U	0.051	UJ	0.032	0.051	ug/L	BS
SS	NDW06FD04P-R01	FD	SW8330	METHOD	tetryl	163	U	163	UJ	91.4	163	ug/Kg	BS
SD	NDW06FD03P-R01	FD	SW8330	METHOD	tetryl	169	U	169	UJ	94.6	169	ug/Kg	BS
SD	NDW06SD10-R01	N	SW8330	METHOD	tetryl	157	U	157	UJ	87.8	157	ug/Kg	BS
SS	NDW06SS13-R01	N	SW8330	METHOD	tetryl	159	U	159	UJ	88.8	159	ug/Kg	BS
SD	NDW06SD13-R01	N	SW8330	METHOD	tetryl	164	U	164	UJ	91.6	164	ug/Kg	BS
SS	NDW06SS11-R01	N	SW8330	METHOD	tetryl	164	U	164	UJ	91.6	164	ug/Kg	BS
SS	NDW06SS22-R01	N	SW8330	METHOD	tetryl	164	U	164	UJ	91.8	164	ug/Kg	BS
SS	NDW06SS10-R01	N	SW8330	METHOD	tetryl	165	U	165	UJ	92.3	165	ug/Kg	BS
SS	NDW06SS09-R01	N	SW8330	METHOD	tetryl	166	U	166	UJ	92.7	166	ug/Kg	BS
SS	NDW06SS21-R01	N	SW8330	METHOD	tetryl	166	U	166	UJ	92.7	166	ug/Kg	BS
SS	NDW06SS23-R01	N	SW8330	METHOD	tetryl	167	U	167	UJ	93.3	167	ug/Kg	BS
SD	NDW06SD11-R01	N	SW8330	METHOD	tetryl	171	U	171	UJ	96.0	171	ug/Kg	BS

EXHIBIT 4
Change in Qualifier Through the Data Validation Process

Matrix	Sample ID	Sample Type	Analytical Method	Prep Method	Parameter	Lab Result	Lab Qual	Final Result	Final Qual	DL	RL	Units	DV Notes
SS	NDW06SS20-R01	N	SW8330	METHOD	tetryl	180	U	180	UJ	101	180	ug/Kg	BS
SS	NDW06SS12-R01	N	SW8330	METHOD	tetryl	182	U	182	UJ	102	182	ug/Kg	BS
SD	NDW06SD02-R01	N	SW8330	METHOD	tetryl	184	U	184	UJ	103	184	ug/Kg	BS
SD	NDW06SD14-R01	N	SW8330	METHOD	tetryl	184	U	184	UJ	103	184	ug/Kg	BS
SD	NDW06SD12-R01	N	SW8330	METHOD	tetryl	196	U	196	UJ	110	196	ug/Kg	BS
SS	NDW06SS17-R01	N	SW8330	METHOD	tetryl	208	U	208	UJ	116	208	ug/Kg	BS
SS	NDW06SS19-R01	N	SW8330	METHOD	tetryl	211	U	211	UJ	118	211	ug/Kg	BS
SS	NDW06SS18-R01	N	SW8330	METHOD	tetryl	215	U	215	UJ	120	215	ug/Kg	BS
SS	NDW06SS14-R01	N	SW8330	METHOD	tetryl	218	U	218	UJ	122	218	ug/Kg	BS
SS	NDW06SS16-R01	N	SW8330	METHOD	tetryl	218	U	218	UJ	122	218	ug/Kg	BS
SS	NDW06SS15-R01	N	SW8330	METHOD	tetryl	230	U	230	UJ	129	230	ug/Kg	BS
SD	NDW06SD03-R01	N	SW8330	METHOD	tetryl	288	U	288	UJ	161	288	ug/Kg	BS
SD	NDW06SD15K-R01	N	SW8330	METHOD	tetryl	304	U	304	UJ	170	304	ug/Kg	BS
SD	NDW06SD06-R01	N	SW8330	METHOD	tetryl	305	U	305	UJ	171	305	ug/Kg	BS
SD	NDW06SD16K-R01	N	SW8330	METHOD	tetryl	311	U	311	UJ	174	311	ug/Kg	BS
SD	NDW06SD09-R01	N	SW8330	METHOD	tetryl	338	U	338	UJ	189	338	ug/Kg	BS
SD	NDW06SD05-R01	N	SW8330	METHOD	tetryl	398	U	398	UJ	223	398	ug/Kg	BS
SD	NDW06SD07-R01	N	SW8330	METHOD	tetryl	403	U	403	UJ	226	403	ug/Kg	BS
SD	NDW06SD08-R01	N	SW8330	METHOD	tetryl	404	U	404	UJ	226	404	ug/Kg	BS
SD	NDW06SD15K-R01	N	SW8081	SW3550	Aldrin	4.1	U	4.1	UJ	0.24	4.1	ug/Kg	CC
SS	NDW06SS13-R01	N	SW8081	SW3550	delta bhc	2.2	U	2.2	UJ	0.091	2.2	ug/Kg	CC
SS	NDW06SS10-R01	N	SW8081	SW3550	delta bhc	2.3	U	2.3	UJ	0.096	2.3	ug/Kg	CC
SS	NDW06SS09-R01	N	SW8081	SW3550	delta bhc	2.3	U	2.3	UJ	0.097	2.3	ug/Kg	CC
SS	NDW06SS12-R01	N	SW8081	SW3550	delta bhc	2.4	U	2.4	UJ	0.10	2.4	ug/Kg	CC
SS	NDW06SS17-R01	N	SW8081	SW3550	delta bhc	2.9	U	2.9	UJ	0.12	2.9	ug/Kg	CC
SS	NDW06SS18-R01	N	SW8081	SW3550	delta bhc	2.9	U	2.9	UJ	0.12	2.9	ug/Kg	CC
SS	NDW06SS14-R01	N	SW8081	SW3550	delta bhc	3	U	3	UJ	0.13	3.0	ug/Kg	CC
SS	NDW06SS16-R01	N	SW8081	SW3550	delta bhc	3	U	3	UJ	0.13	3.0	ug/Kg	CC
SS	NDW06SS15-R01	N	SW8081	SW3550	delta bhc	3.1	U	3.1	UJ	0.13	3.1	ug/Kg	CC
SD	NDW06SD05-R01DL1	LR	SW8081	SW3550	endrin	100	U	100	UJ	2.8	100	ug/Kg	CC
SD	NDW06SD13-R01	N	SW8081	SW3550	endrin	4.3	U	4.3	UJ	0.12	4.3	ug/Kg	CC
SD	NDW06SD11-R01	N	SW8081	SW3550	endrin	4.5	U	4.5	UJ	0.12	4.5	ug/Kg	CC
SD	NDW06SD02-R01	N	SW8081	SW3550	endrin	4.9	U	4.9	UJ	0.13	4.9	ug/Kg	CC
SD	NDW06SD03-R01	N	SW8081	SW3550	endrin	7.6	U	7.6	UJ	0.20	7.6	ug/Kg	CC
SS	NDW06FD04P-R01	FD	SW8081	SW3550	endrin ketone	4.3	U	4.3	UJ	0.25	4.3	ug/Kg	CC
SS	NDW06SS22-R01	N	SW8081	SW3550	endrin ketone	4.3	U	4.3	UJ	0.25	4.3	ug/Kg	CC
SD	NDW06SD15K-R01	N	SW8081	SW3550	endrin ketone	8	U	8	UJ	0.46	8.0	ug/Kg	CC
SS	NDW06SS21-R01	N	SW8081	SW3550	endrin ketone	44	U	44	UJ	2.5	44.0	ug/Kg	CC
SS	NDW06SS23-R01	N	SW8081	SW3550	endrin ketone	44	U	44	UJ	2.5	44.0	ug/Kg	CC
SS	NDW06SS20-R01	N	SW8081	SW3550	endrin ketone	48	U	48	UJ	2.8	48.0	ug/Kg	CC
SS	NDW06SS19-R01	N	SW8081	SW3550	endrin ketone	56	U	56	UJ	3.2	56.0	ug/Kg	CC
SD	NDW06SD15K-R01	N	SW8081	SW3550	p,p'-DDT	8	U	8	UJ	0.46	8.0	ug/Kg	CC
WG	NDW06FD01P-R01	FD	SW8260B	SW5030	1,1,2-trichloro-1,2,2-trifluoroethane	0.5	U	0.5	UJ	0.36	0.50	ug/L	CC
WG	NDW06GW01-R01	N	SW8260B	SW5030	1,1,2-trichloro-1,2,2-trifluoroethane	0.5	U	0.5	UJ	0.36	0.50	ug/L	CC
WG	NDW06GW02-R01	N	SW8260B	SW5030	1,1,2-trichloro-1,2,2-trifluoroethane	0.5	U	0.5	UJ	0.36	0.50	ug/L	CC

EXHIBIT 4
Change in Qualifier Through the Data Validation Process

Matrix	Sample ID	Sample Type	Analytical Method	Prep Method	Parameter	Lab Result	Lab Qual	Final Result	Final Qual	DL	RL	Units	DV Notes
WG	NDW06GW03-R01	N	SW8260B	SW5030	1,1,2-trichloro-1,2,2-trifluoroethane	0.5	U	0.5	UJ	0.36	0.50	ug/L	CC
WG	NDW06GW05-R01	N	SW8260B	SW5030	1,1,2-trichloro-1,2,2-trifluoroethane	0.5	U	0.5	UJ	0.36	0.50	ug/L	CC
WG	NDW06GW06-R01	N	SW8260B	SW5030	1,1,2-trichloro-1,2,2-trifluoroethane	0.5	U	0.5	UJ	0.36	0.50	ug/L	CC
SB	NDA095FD1	FD	SW8260B	SW5030	2-butanone (MEK)	2	U	2	J	2.0	10.0	ug/Kg	CC
SS	NDA104FD1	FD	SW8260B	SW5030	2-butanone (MEK)	14	U	14	R	2.0	14.0	ug/Kg	CC
SB	NDA106FD1	FD	SW8260B	SW5030	2-butanone (MEK)	16	U	16	R	3.0	16.0	ug/Kg	CC
SD	NDA307FD1	FD	SW8260B	SW5030	2-butanone (MEK)	20	J	20	J	10.0	56.0	ug/Kg	CC
WS	NDA038FD1	FD	SW8260B	SW5030	2-butanone (MEK)	10	U	10	R	2.0	10.0	ug/L	CC
SB	NDA093	N	SW8260B	SW5030	2-butanone (MEK)	2	U	2	J	2.0	10.0	ug/Kg	CC
SS	NDA113	N	SW8260B	SW5030	2-butanone (MEK)	10	U	10	R	2.0	10.0	ug/Kg	CC
SS	NDA115	N	SW8260B	SW5030	2-butanone (MEK)	10	U	10	R	2.0	10.0	ug/Kg	CC
SS	NDA117	N	SW8260B	SW5030	2-butanone (MEK)	10	U	10	R	2.0	10.0	ug/Kg	CC
SB	NDA092	N	SW8260B	SW5030	2-butanone (MEK)	3	J	3	J	2.0	11.0	ug/Kg	CC
SB	NDA114	N	SW8260B	SW5030	2-butanone (MEK)	11	U	11	R	2.0	11.0	ug/Kg	CC
SB	NDA116	N	SW8260B	SW5030	2-butanone (MEK)	11	U	11	R	2.0	11.0	ug/Kg	CC
SB	NDA110	N	SW8260B	SW5030	2-butanone (MEK)	11	U	11	R	2.0	11.0	ug/Kg	CC
SB	NDA112	N	SW8260B	SW5030	2-butanone (MEK)	11	U	11	R	2.0	11.0	ug/Kg	CC
SD	NDA043	N	SW8260B	SW5030	2-butanone (MEK)	4	J	4	J	2.0	11.0	ug/Kg	CC
SS	NDA109	N	SW8260B	SW5030	2-butanone (MEK)	11	U	11	R	2.0	11.0	ug/Kg	CC
SB	NDA085	N	SW8260B	SW5030	2-butanone (MEK)	2	U	2	J	2.0	12.0	ug/Kg	CC
SB	NDA094	N	SW8260B	SW5030	2-butanone (MEK)	3	J	3	J	2.0	12.0	ug/Kg	CC
SB	NDA118	N	SW8260B	SW5030	2-butanone (MEK)	12	U	12	R	2.0	12.0	ug/Kg	CC
SD	NDA042	N	SW8260B	SW5030	2-butanone (MEK)	4	J	4	J	2.0	12.0	ug/Kg	CC
SS	NDA107	N	SW8260B	SW5030	2-butanone (MEK)	12	U	12	R	2.0	12.0	ug/Kg	CC
SS	NDA111	N	SW8260B	SW5030	2-butanone (MEK)	12	U	12	R	2.0	12.0	ug/Kg	CC
SB	NDA108	N	SW8260B	SW5030	2-butanone (MEK)	13	U	13	R	2.0	13.0	ug/Kg	CC
SS	NDA084	N	SW8260B	SW5030	2-butanone (MEK)	2	U	2	J	2.0	13.0	ug/Kg	CC
SS	NDA103	N	SW8260B	SW5030	2-butanone (MEK)	13	U	13	R	2.0	13.0	ug/Kg	CC
SB	NDA102	N	SW8260B	SW5030	2-butanone (MEK)	3	J	3	J	2.0	14.0	ug/Kg	CC
SS	NDA101	N	SW8260B	SW5030	2-butanone (MEK)	3	J	3	J	2.0	14.0	ug/Kg	CC
SB	NDA105	N	SW8260B	SW5030	2-butanone (MEK)	17	U	17	R	3.0	17.0	ug/Kg	CC
SD	NDA302	N	SW8260B	SW5030	2-butanone (MEK)	26	U	26	R	4.0	26.0	ug/Kg	CC
SD	NDA045	N	SW8260B	SW5030	2-butanone (MEK)	36	U	36	R	6.0	36.0	ug/Kg	CC
SD	NDA046	N	SW8260B	SW5030	2-butanone (MEK)	12	J	12	J	7.0	43.0	ug/Kg	CC
SD	NDA303	N	SW8260B	SW5030	2-butanone (MEK)	12	J	12	J	8.0	47.0	ug/Kg	CC
SD	NDA044	N	SW8260B	SW5030	2-butanone (MEK)	17	J	17	J	10.0	59.0	ug/Kg	CC
WG	NDA005	N	SW8260B	SW5030	2-butanone (MEK)	5	U	5	UJ	2.0	5.0	ug/L	CC
WG	NDA006	N	SW8260B	SW5030	2-butanone (MEK)	5	U	5	UJ	2.0	5.0	ug/L	CC
WG	NDA008	N	SW8260B	SW5030	2-butanone (MEK)	5	U	5	UJ	2.0	5.0	ug/L	CC
WG	NDA009	N	SW8260B	SW5030	2-butanone (MEK)	5	U	5	UJ	2.0	5.0	ug/L	CC
WG	NDA010	N	SW8260B	SW5030	2-butanone (MEK)	5	U	5	UJ	2.0	5.0	ug/L	CC
WG	NDA011	N	SW8260B	SW5030	2-butanone (MEK)	5	U	5	UJ	2.0	5.0	ug/L	CC
WG	NDA012	N	SW8260B	SW5030	2-butanone (MEK)	5	U	5	UJ	2.0	5.0	ug/L	CC
WS	NDA035	N	SW8260B	SW5030	2-butanone (MEK)	10	U	10	R	2.0	10.0	ug/L	CC
WS	NDA036	N	SW8260B	SW5030	2-butanone (MEK)	10	U	10	R	2.0	10.0	ug/L	CC

EXHIBIT 4
Change in Qualifier Through the Data Validation Process

Matrix	Sample ID	Sample Type	Analytical Method	Prep Method	Parameter	Lab Result	Lab Qual	Final Result	Final Qual	DL	RL	Units	DV Notes
WS	NDA037	N	SW8260B	SW5030	2-butanone (MEK)	10	U	10	R	2.0	10.0	ug/L	CC
WS	NDA039	N	SW8260B	SW5030	2-butanone (MEK)	10	U	10	R	2.0	10.0	ug/L	CC
WS	NDA040	N	SW8260B	SW5030	2-butanone (MEK)	10	U	10	R	2.0	10.0	ug/L	CC
WS	NDA300	N	SW8260B	SW5030	2-butanone (MEK)	10	U	10	R	2.0	10.0	ug/L	CC
WS	NDA301	N	SW8260B	SW5030	2-butanone (MEK)	10	U	10	R	2.0	10.0	ug/L	CC
SS	NDA104FD1	FD	SW8260B	SW5030	Acetone	14	U	14	R	14.0	14.0	ug/Kg	CC
WS	NDA038FD1	FD	SW8260B	SW5030	Acetone	10	U	10	R	10.0	10.0	ug/L	CC
SB	NDA093	N	SW8260B	SW5030	Acetone	39	=	39	R	9.0	10.0	ug/Kg	CC
SS	NDA113	N	SW8260B	SW5030	Acetone	10	U	10	R	10.0	10.0	ug/Kg	CC
SS	NDW06SS13-R01	N	SW8260B	SW5030	Acetone	10.7	U	10.7	UJ	4.0	10.7	ug/Kg	CC
SD	NDW06SD10-R01	N	SW8260B	SW5030	Acetone	10.9	U	10.9	UJ	4.0	10.9	ug/Kg	CC
SB	NDA092	N	SW8260B	SW5030	Acetone	40	=	40	R	11.0	11.0	ug/Kg	CC
SB	NDA110	N	SW8260B	SW5030	Acetone	11	U	11	R	11.0	11.0	ug/Kg	CC
SD	NDA043	N	SW8260B	SW5030	Acetone	36	=	36	R	11.0	11.0	ug/Kg	CC
SS	NDA109	N	SW8260B	SW5030	Acetone	11	U	11	R	11.0	11.0	ug/Kg	CC
SS	NDW06SS09-R01	N	SW8260B	SW5030	Acetone	12	U	12	UJ	4.4	12.0	ug/Kg	CC
SB	NDA085	N	SW8260B	SW5030	Acetone	29	=	29	R	12.0	12.0	ug/Kg	CC
SB	NDA094	N	SW8260B	SW5030	Acetone	50	=	50	R	12.0	12.0	ug/Kg	CC
SD	NDA042	N	SW8260B	SW5030	Acetone	37	=	37	R	12.0	12.0	ug/Kg	CC
SS	NDA107	N	SW8260B	SW5030	Acetone	12	U	12	R	12.0	12.0	ug/Kg	CC
SS	NDA111	N	SW8260B	SW5030	Acetone	12	U	12	R	12.0	12.0	ug/Kg	CC
SS	NDW06SS11-R01	N	SW8260B	SW5030	Acetone	12.4	U	12.4	UJ	4.6	12.4	ug/Kg	CC
SS	NDA084	N	SW8260B	SW5030	Acetone	36	=	36	R	13.0	13.0	ug/Kg	CC
SS	NDW06SS12-R01	N	SW8260B	SW5030	Acetone	13.7	U	13.7	UJ	5.0	13.7	ug/Kg	CC
SD	NDW06SD02-R01	N	SW8260B	SW5030	Acetone	268	=	268	J	6.5	17.5	ug/Kg	CC
SS	NDW06SS15-R01	N	SW8260B	SW5030	Acetone	19.8	U	19.8	UJ	7.3	19.8	ug/Kg	CC
SS	NDW06SS16-R01	N	SW8260B	SW5030	Acetone	20.5	U	20.5	UJ	7.6	20.5	ug/Kg	CC
SS	NDW06SS17-R01	N	SW8260B	SW5030	Acetone	20.6	U	20.6	UJ	7.6	20.6	ug/Kg	CC
SD	NDA045	N	SW8260B	SW5030	Acetone	70	=	70	R	36.0	36.0	ug/Kg	CC
SD	NDW06SD15K-R01	N	SW8260B	SW5030	Acetone	37.6	U	37.6	UJ	13.9	37.6	ug/Kg	CC
SD	NDW06SD16K-R01	N	SW8260B	SW5030	Acetone	40	U	40	UJ	14.8	40.0	ug/Kg	CC
SD	NDA046	N	SW8260B	SW5030	Acetone	97	=	97	R	43.0	43.0	ug/Kg	CC
SD	NDW06SD08-R01	N	SW8260B	SW5030	Acetone	52.5	U	52.5	UJ	19.4	52.5	ug/Kg	CC
SD	NDA044	N	SW8260B	SW5030	Acetone	140	=	140	R	59.0	59.0	ug/Kg	CC
WS	NDA035	N	SW8260B	SW5030	Acetone	10	U	10	R	10.0	10.0	ug/L	CC
WS	NDA036	N	SW8260B	SW5030	Acetone	10	U	10	R	10.0	10.0	ug/L	CC
WS	NDA037	N	SW8260B	SW5030	Acetone	10	U	10	R	10.0	10.0	ug/L	CC
WS	NDA039	N	SW8260B	SW5030	Acetone	10	U	10	R	10.0	10.0	ug/L	CC
WS	NDA040	N	SW8260B	SW5030	Acetone	10	U	10	R	10.0	10.0	ug/L	CC
WS	NDA300	N	SW8260B	SW5030	Acetone	10	U	10	R	10.0	10.0	ug/L	CC
WS	NDA301	N	SW8260B	SW5030	Acetone	10	U	10	R	10.0	10.0	ug/L	CC
SD	NDW06SD12-R01	N	SW8260B	SW5030	cyclohexane	14.9	U	14.9	UJ	0.45	14.9	ug/Kg	CC
SD	NDW06SD15K-R01	N	SW8260B	SW5030	cyclohexane	37.6	U	37.6	UJ	1.1	37.6	ug/Kg	CC
SD	NDW06SD16K-R01	N	SW8260B	SW5030	cyclohexane	40	U	40	UJ	1.2	40.0	ug/Kg	CC
SD	NDW06SD08-R01	N	SW8260B	SW5030	cyclohexane	52.5	U	52.5	UJ	1.6	52.5	ug/Kg	CC

EXHIBIT 4
Change in Qualifier Through the Data Validation Process

Matrix	Sample ID	Sample Type	Analytical Method	Prep Method	Parameter	Lab Result	Lab Qual	Final Result	Final Qual	DL	RL	Units	DV Notes
WG	NDA005	N	SW8260B	SW5030	Tetrachloroethene (PCE)	1	U	1	UJ	0.50	1.0	ug/L	CC
WG	NDA006	N	SW8260B	SW5030	Tetrachloroethene (PCE)	1	U	1	UJ	0.50	1.0	ug/L	CC
WG	NDA008	N	SW8260B	SW5030	Tetrachloroethene (PCE)	1	U	1	UJ	0.50	1.0	ug/L	CC
WG	NDA009	N	SW8260B	SW5030	Tetrachloroethene (PCE)	1	U	1	UJ	0.50	1.0	ug/L	CC
WG	NDA010	N	SW8260B	SW5030	Tetrachloroethene (PCE)	1	U	1	UJ	0.50	1.0	ug/L	CC
WG	NDA011	N	SW8260B	SW5030	Tetrachloroethene (PCE)	1	U	1	UJ	0.50	1.0	ug/L	CC
WG	NDA012	N	SW8260B	SW5030	Tetrachloroethene (PCE)	1	U	1	UJ	0.50	1.0	ug/L	CC
SD	NDW06SD10-R01	N	SW8270C	SW3550	2,4,5-Trichlorophenol	1220	U	1220	UJ	34.6	1220	ug/Kg	CC
SD	NDW06SD12-R01	N	SW8270C	SW3550	2,4,5-Trichlorophenol	1540	U	1540	UJ	43.4	1540	ug/Kg	CC
SD	NDW06SD06-R01	N	SW8270C	SW3550	2,4,5-Trichlorophenol	2380	U	2380	UJ	67.3	2380	ug/Kg	CC
SD	NDW06SD15K-R01	N	SW8270C	SW3550	2,4,5-Trichlorophenol	2400	U	2400	UJ	67.9	2400	ug/Kg	CC
SD	NDW06SD16K-R01	N	SW8270C	SW3550	2,4,5-Trichlorophenol	2450	U	2450	UJ	69.2	2450	ug/Kg	CC
SD	NDW06SD09-R01	N	SW8270C	SW3550	2,4,5-Trichlorophenol	2640	U	2640	UJ	74.6	2640	ug/Kg	CC
SD	NDW06SD07-R01	N	SW8270C	SW3550	2,4,5-Trichlorophenol	3140	U	3140	UJ	88.8	3140	ug/Kg	CC
SD	NDW06SD08-R01	N	SW8270C	SW3550	2,4,5-Trichlorophenol	3180	U	3180	UJ	89.9	3180	ug/Kg	CC
SD	NDW06FD03P-R01	FD	SW8270C	SW3550	2,4-Dinitrophenol	1340	U	1340	UJ	63.7	1340	ug/Kg	CC
WG	NDW06FD01P-R01	FD	SW8270C	SW3510	2,4-Dinitrophenol	20.4	U	20.4	UJ	1.3	20.4	ug/L	CC
SD	NDW06SD10-R01	N	SW8270C	SW3550	2,4-Dinitrophenol	1220	U	1220	UJ	58.0	1220	ug/Kg	CC
SD	NDW06SD13-R01	N	SW8270C	SW3550	2,4-Dinitrophenol	1300	U	1300	UJ	61.7	1300	ug/Kg	CC
SD	NDW06SD11-R01	N	SW8270C	SW3550	2,4-Dinitrophenol	1330	U	1330	UJ	63.3	1330	ug/Kg	CC
SD	NDW06SD02-R01	N	SW8270C	SW3550	2,4-Dinitrophenol	1470	U	1470	UJ	69.8	1470	ug/Kg	CC
SD	NDW06SD14-R01	N	SW8270C	SW3550	2,4-Dinitrophenol	1500	U	1500	UJ	71.3	1500	ug/Kg	CC
SD	NDW06SD12-R01	N	SW8270C	SW3550	2,4-Dinitrophenol	1540	U	1540	UJ	72.9	1540	ug/Kg	CC
SD	NDW06SD03-R01	N	SW8270C	SW3550	2,4-Dinitrophenol	2290	U	2290	UJ	109	2290	ug/Kg	CC
SD	NDW06SD06-R01	N	SW8270C	SW3550	2,4-Dinitrophenol	2380	U	2380	UJ	113	2380	ug/Kg	CC
SD	NDW06SD15K-R01	N	SW8270C	SW3550	2,4-Dinitrophenol	2400	U	2400	UJ	114	2400	ug/Kg	CC
SD	NDW06SD16K-R01	N	SW8270C	SW3550	2,4-Dinitrophenol	2450	U	2450	UJ	116	2450	ug/Kg	CC
SD	NDW06SD09-R01	N	SW8270C	SW3550	2,4-Dinitrophenol	2640	U	2640	UJ	125	2640	ug/Kg	CC
SD	NDW06SD05-R01	N	SW8270C	SW3550	2,4-Dinitrophenol	3110	U	3110	UJ	148	3110	ug/Kg	CC
SD	NDW06SD07-R01	N	SW8270C	SW3550	2,4-Dinitrophenol	3140	U	3140	UJ	149	3140	ug/Kg	CC
SD	NDW06SD08-R01	N	SW8270C	SW3550	2,4-Dinitrophenol	3180	U	3180	UJ	151	3180	ug/Kg	CC
WG	NDW06GW01-R01	N	SW8270C	SW3510	2,4-Dinitrophenol	20.4	U	20.4	UJ	1.3	20.4	ug/L	CC
WG	NDW06GW03-R01	N	SW8270C	SW3510	2,4-Dinitrophenol	20.4	U	20.4	UJ	1.3	20.4	ug/L	CC
WG	NDW06GW02-R01	N	SW8270C	SW3510	2,4-Dinitrophenol	20.8	U	20.8	UJ	1.3	20.8	ug/L	CC
WG	NDW06GW06-R01	N	SW8270C	SW3510	2,4-Dinitrophenol	20.8	U	20.8	UJ	1.3	20.8	ug/L	CC
WG	NDW06GW05-R01	N	SW8270C	SW3510	2,4-Dinitrophenol	21.3	U	21.3	UJ	1.4	21.3	ug/L	CC
SD	NDW06SD10-R01	N	SW8270C	SW3550	4,6-Dinitro-2-methylphenol	1220	U	1220	UJ	642	1220	ug/Kg	CC
SD	NDW06SD12-R01	N	SW8270C	SW3550	4,6-Dinitro-2-methylphenol	1540	U	1540	UJ	807	1540	ug/Kg	CC
SD	NDW06SD06-R01	N	SW8270C	SW3550	4,6-Dinitro-2-methylphenol	2380	U	2380	UJ	1250	2380	ug/Kg	CC
SD	NDW06SD15K-R01	N	SW8270C	SW3550	4,6-Dinitro-2-methylphenol	2400	U	2400	UJ	1260	2400	ug/Kg	CC
SD	NDW06SD16K-R01	N	SW8270C	SW3550	4,6-Dinitro-2-methylphenol	2450	U	2450	UJ	1280	2450	ug/Kg	CC
SD	NDW06SD09-R01	N	SW8270C	SW3550	4,6-Dinitro-2-methylphenol	2840	U	2640	UJ	1390	2640	ug/Kg	CC
SD	NDW06SD07-R01	N	SW8270C	SW3550	4,6-Dinitro-2-methylphenol	3140	U	3140	UJ	1650	3140	ug/Kg	CC
SD	NDW06SD08-R01	N	SW8270C	SW3550	4,6-Dinitro-2-methylphenol	3180	U	3180	UJ	1670	3180	ug/Kg	CC
SD	NDW06SD10-R01	N	SW8270C	SW3550	Indeno(1,2,3-c,d)pyrene	408	U	408	UJ	42.0	408	ug/Kg	CC

EXHIBIT 4
Change in Qualifier Through the Data Validation Process

Matrix	Sample ID	Sample Type	Analytical Method	Prep Method	Parameter	Lab Result	Lab Qual	Final Result	Final Qual	DL	RL	Units	DV Notes
SD	NDW06SD12-R01	N	SW8270C	SW3550	Indeno(1,2,3-c,d)pyrene	512	U	512	UJ	52.8	512	ug/Kg	CC
SD	NDW06SD06-R01	N	SW8270C	SW3550	Indeno(1,2,3-c,d)pyrene	793	U	793	UJ	81.7	793	ug/Kg	CC
SD	NDW06SD15K-R01	N	SW8270C	SW3550	Indeno(1,2,3-c,d)pyrene	800	U	800	UJ	82.4	800	ug/Kg	CC
SD	NDW06SD16K-R01	N	SW8270C	SW3550	Indeno(1,2,3-c,d)pyrene	816	U	816	UJ	84.0	816	ug/Kg	CC
SD	NDW06SD09-R01	N	SW8270C	SW3550	Indeno(1,2,3-c,d)pyrene	880	U	880	UJ	90.6	880	ug/Kg	CC
SD	NDW06SD07-R01	N	SW8270C	SW3550	Indeno(1,2,3-c,d)pyrene	1050	U	1050	UJ	108	1050	ug/Kg	CC
SD	NDW06SD08-R01	N	SW8270C	SW3550	Indeno(1,2,3-c,d)pyrene	1060	U	1060	UJ	109	1060	ug/Kg	CC
WS	NDA038FD1	FD	SW8330	METHOD	octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine	5	U	5	UJ	0.30	5.0	ug/L	CC
WS	NDA035	N	SW8330	METHOD	octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine	5	U	5	UJ	0.30	5.0	ug/L	CC
WS	NDA036	N	SW8330	METHOD	octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine	5	U	5	UJ	0.30	5.0	ug/L	CC
WS	NDA040	N	SW8330	METHOD	octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine	5	U	5	UJ	0.30	5.0	ug/L	CC
WS	NDA301	N	SW8330	METHOD	octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine	5	U	5	UJ	0.30	5.0	ug/L	CC
SB	NDA095FD1	FD	SW8260B	SW5030	Acetone	41	=	41	R	10.0	10.0	ug/Kg	CC
SD	NDA307FD1	FD	SW8260B	SW5030	Acetone	145	=	145	R	56.0	56.0	ug/Kg	CC
SS	NDA115	N	SW8260B	SW5030	Acetone	20	=	20	R	10.0	10.0	ug/Kg	CC
SS	NDA117	N	SW8260B	SW5030	Acetone	11	=	11	R	10.0	10.0	ug/Kg	CC
SB	NDA114	N	SW8260B	SW5030	Acetone	13	=	13	R	11.0	11.0	ug/Kg	CC
SB	NDA116	N	SW8260B	SW5030	Acetone	26	=	26	R	11.0	11.0	ug/Kg	CC
SB	NDA118	N	SW8260B	SW5030	Acetone	67	=	67	R	12.0	12.0	ug/Kg	CC
SB	NDA102	N	SW8260B	SW5030	Acetone	25	=	25	R	14.0	14.0	ug/Kg	CC
SS	NDA101	N	SW8260B	SW5030	Acetone	20	=	20	R	14.0	14.0	ug/Kg	CC
SD	NDA302	N	SW8260B	SW5030	Acetone	41	=	41	R	26.0	26.0	ug/Kg	CC
SD	NDW06SD03-R01	N	SW8260B	SW5030	Acetone	315	E	315	J	5.6	15.1	ug/Kg	CC
SD	NDW06SD14-R01	N	SW8260B	SW5030	Acetone	604	E	604	J	5.7	15.5	ug/Kg	CC
WG	NDW06FD01P-R01	FD	SW6010B	SW3010A	Arsenic	73.7	B	73.7	J	20.4	100	ug/L	FD
WG	NDW06GW05-R01	N	SW6010B	SW3010A	Arsenic	152	=	152	J	20.4	100	ug/L	FD
WG	NDW06FD01P-R01	FD	SW6010B	SW3010A	Cadmium	5.28	B	5.28	J	3.6	50.0	ug/L	FD
WG	NDW06GW05-R01	N	SW6010B	SW3010A	Cadmium	14.2	B	14.2	J	3.6	50.0	ug/L	FD
WG	NDW06FD01P-R01	FD	SW6010B	SW3010A	Chromium, total	32.7	B	32.7	J	5.7	100	ug/L	FD
WG	NDW06GW05-R01	N	SW6010B	SW3010A	Chromium, total	58.8	B	58.8	J	5.7	100	ug/L	FD
WG	NDW06FD01P-R01R1	LR	SW6010B	SW3010A	Lead	148	=	148	J	17.6	30.0	ug/L	FD
WG	NDW06GW05-R01R1	LR	SW6010B	SW3010A	Lead	71	=	71	J	17.6	30.0	ug/L	FD
WG	NDW06FD01P-R01R1	LR	SW6010B	SW3010A	Selenium	253	=	253	J	21.0	50.0	ug/L	FD
WG	NDW06GW05-R01R1	LR	SW6010B	SW3010A	Selenium	127	=	127	J	21.0	50.0	ug/L	FD
WG	NDW06FD01P-R01	FD	SW6010B	SW3010A	Thallium	39.5	B	39.5	J	25.4	100	ug/L	FD
WG	NDW06GW05-R01	N	SW6010B	SW3010A	Thallium	60.4	B	60.4	J	25.4	100	ug/L	FD
SS	NDW06FD04P-R01	FD	SW6010B	SW3050B	Zinc	125	=	125	J	0.093	4.9	mg/Kg	FD
SS	NDW06SS10-R01	N	SW6010B	SW3050B	Zinc	12.9	=	12.9	J	0.084	4.5	mg/Kg	FD
SB	NDA106FD1	FD	SW8081	SW3550	p,p'-DDE	5.3	=	5.3	J	0.54	5.3	ug/Kg	FD
SB	NDA105	N	SW8081	SW3550	p,p'-DDE	11	=	11	J	0.54	5.3	ug/Kg	FD
WS	NDW06SW06-R01	N	E353.2	FLDFLT	nitrogen, nitrate (as n)	0.0244	B	0.0244	J	0.020	1.0	mg/L	HT
WS	NDW06SW07-R01	N	E353.2	FLDFLT	nitrogen, nitrate (as n)	0.0201	U	0.0201	UJ	0.020	1.0	mg/L	HT
WG	NDW06GW04-R01	N	E353.2	NONE	nitrogen, nitrate (as n)	0.196	B	0.196	J	0.020	1.0	mg/L	HT
WG	NDW06GW07-R01	N	E353.2	NONE	nitrogen, nitrate (as n)	0.131	B	0.131	J	0.020	1.0	mg/L	HT
WG	NDW06GW08-R01	N	E353.2	NONE	nitrogen, nitrate (as n)	0.0201	U	0.0201	UJ	0.020	1.0	mg/L	HT

EXHIBIT 4
Change in Qualifier Through the Data Validation Process

Matrix	Sample ID	Sample Type	Analytical Method	Prep Method	Parameter	Lab Result	Lab Qual	Final Result	Final Qual	DL	RL	Units	DV Notes
WS	NDW06SW06-R01	N	E353.2	NONE	nitrogen, nitrate (as n)	0.0201	U	0.0201	UJ	0.020	1.0	mg/L	HT
WS	NDW06SW07-R01	N	E353.2	NONE	nitrogen, nitrate (as n)	0.0201	U	0.0201	UJ	0.020	1.0	mg/L	HT
WS	NDW06SW10K-R01	N	E353.2	NONE	nitrogen, nitrate (as n)	0.0201	U	0.0201	UJ	0.020	1.0	mg/L	HT
WS	NDW06SW11K-R01	N	E353.2	NONE	nitrogen, nitrate (as n)	0.0201	U	0.0201	UJ	0.020	1.0	mg/L	HT
WS	NDW06SW06-R01	N	E354.1	FLDFLT	nitrogen, nitrite	0.0253	B	0.0253	J	0.012	1.0	mg/L	HT
WS	NDW06SW07-R01	N	E354.1	FLDFLT	nitrogen, nitrite	0.0271	B	0.0271	J	0.012	1.0	mg/L	HT
WG	NDW06GW04-R01	N	E354.1	NONE	nitrogen, nitrite	0.0431	B	0.0431	J	0.012	1.0	mg/L	HT
WG	NDW06GW07-R01	N	E354.1	NONE	nitrogen, nitrite	0.0479	B	0.0479	J	0.012	1.0	mg/L	HT
WG	NDW06GW08-R01	N	E354.1	NONE	nitrogen, nitrite	0.0384	B	0.0384	J	0.012	1.0	mg/L	HT
WS	NDW06SW06-R01	N	E354.1	NONE	nitrogen, nitrite	0.0245	B	0.0245	J	0.012	1.0	mg/L	HT
WS	NDW06SW07-R01	N	E354.1	NONE	nitrogen, nitrite	0.0245	B	0.0245	J	0.012	1.0	mg/L	HT
WS	NDW06SW10K-R01	N	E354.1	NONE	nitrogen, nitrite	0.028	B	0.028	J	0.012	1.0	mg/L	HT
WS	NDW06SW11K-R01	N	E354.1	NONE	nitrogen, nitrite	0.0274	B	0.0274	J	0.012	1.0	mg/L	HT
WG	NDW06GW04-R01	N	E365.2	NONE	phosphorus, total orthophosphate (as p)	0.445	B	0.445	J	0.014	1.0	mg/L	HT
WG	NDW06GW07-R01	N	E365.2	NONE	phosphorus, total orthophosphate (as p)	0.38	B	0.38	J	0.014	1.0	mg/L	HT
WG	NDW06GW08-R01	N	E365.2	NONE	phosphorus, total orthophosphate (as p)	0.475	B	0.475	J	0.070	5.0	mg/L	HT
WS	NDW06FD02P-R01	FD	SW8081	SW3510	alpha bhc	0.01	U	0.01	UJ	0.0012	0.010	ug/L	IC
WG	NDA0321FD1	FD	SW8081	SW3510	alpha bhc	0.01	U	0.01	UJ	0.010	0.010	ug/L	IC
WS	NDW06SW06-R01	N	SW8081	SW3510	alpha bhc	0.0099	U	0.0099	UJ	0.0012	0.0099	ug/L	IC
WS	NDW06SW10K-R01	N	SW8081	SW3510	alpha bhc	0.0099	U	0.0099	UJ	0.0012	0.0099	ug/L	IC
WS	NDW06SW03-R01	N	SW8081	SW3510	alpha bhc	0.01	U	0.01	UJ	0.0012	0.010	ug/L	IC
WS	NDW06SW05-R01	N	SW8081	SW3510	alpha bhc	0.01	U	0.01	UJ	0.0012	0.010	ug/L	IC
WS	NDW06SW07-R01	N	SW8081	SW3510	alpha bhc	0.01	U	0.01	UJ	0.0012	0.010	ug/L	IC
WS	NDW06SW08-R01	N	SW8081	SW3510	alpha bhc	0.01	U	0.01	UJ	0.0012	0.010	ug/L	IC
WS	NDW06SW09-R01	N	SW8081	SW3510	alpha bhc	0.01	U	0.01	UJ	0.0012	0.010	ug/L	IC
WS	NDW06SW11K-R01	N	SW8081	SW3510	alpha bhc	0.01	U	0.01	UJ	0.0012	0.010	ug/L	IC
WG	NDA022	N	SW8081	SW3510	alpha bhc	0.01	U	0.01	UJ	0.010	0.010	ug/L	IC
WG	NDA005	N	SW8081	SW3510	alpha bhc	0.01	U	0.01	UJ	0.010	0.010	ug/L	IC
WG	NDA006	N	SW8081	SW3510	alpha bhc	0.01	U	0.01	UJ	0.010	0.010	ug/L	IC
WG	NDA009	N	SW8081	SW3510	alpha bhc	0.01	U	0.01	UJ	0.010	0.010	ug/L	IC
WG	NDA010	N	SW8081	SW3510	alpha bhc	0.01	U	0.01	UJ	0.010	0.010	ug/L	IC
WG	NDA011	N	SW8081	SW3510	alpha bhc	0.01	U	0.01	UJ	0.010	0.010	ug/L	IC
WG	NDA012	N	SW8081	SW3510	alpha bhc	0.01	U	0.01	UJ	0.010	0.010	ug/L	IC
SS	NDA104FD1	FD	SW8081	SW3550	beta endosulfan	4.7	U	4.7	UJ	0.42	4.7	ug/Kg	IC
SB	NDA106FD1	FD	SW8081	SW3550	beta endosulfan	5.3	U	5.3	UJ	0.48	5.3	ug/Kg	IC
SS	NDA107	N	SW8081	SW3550	beta endosulfan	4.2	U	4.2	UJ	0.37	4.2	ug/Kg	IC
SB	NDA112	N	SW8081	SW3550	beta endosulfan	4.3	U	4.3	UJ	0.39	4.3	ug/Kg	IC
SS	NDA109	N	SW8081	SW3550	beta endosulfan	4.3	U	4.3	UJ	0.39	4.3	ug/Kg	IC
SB	NDA108	N	SW8081	SW3550	beta endosulfan	4.4	U	4.4	UJ	0.40	4.4	ug/Kg	IC
SB	NDA110	N	SW8081	SW3550	beta endosulfan	4.4	U	4.4	UJ	0.40	4.4	ug/Kg	IC
SS	NDA101	N	SW8081	SW3550	beta endosulfan	4.4	U	4.4	UJ	0.40	4.4	ug/Kg	IC
SS	NDA111	N	SW8081	SW3550	beta endosulfan	4.4	U	4.4	UJ	0.40	4.4	ug/Kg	IC
SS	NDA103	N	SW8081	SW3550	beta endosulfan	4.5	U	4.5	UJ	0.41	4.5	ug/Kg	IC
SB	NDA102	N	SW8081	SW3550	beta endosulfan	5.2	U	5.2	UJ	0.46	5.2	ug/Kg	IC
SB	NDA105	N	SW8081	SW3550	beta endosulfan	5.3	U	5.3	UJ	0.48	5.3	ug/Kg	IC

EXHIBIT 4
Change in Qualifier Through the Data Validation Process

Matrix	Sample ID	Sample Type	Analytical Method	Prep Method	Parameter	Lab Result	Lab Qual	Final Result	Final Qual	DL	RL	Units	DV Notes
WG	NDA022	N	SW8081	SW3510	beta endosulfan	0.02	U	0.02	UJ	0.010	0.020	ug/L	IC
SS	NDA104FD1	FD	SW8081	SW3550	endrin	4.7	U	4.7	UJ	0.56	4.7	ug/Kg	IC
SB	NDA106FD1	FD	SW8081	SW3550	endrin	5.3	U	5.3	UJ	0.63	5.3	ug/Kg	IC
SS	NDA107	N	SW8081	SW3550	endrin	4.2	U	4.2	UJ	0.50	4.2	ug/Kg	IC
SB	NDA112	N	SW8081	SW3550	endrin	4.3	U	4.3	UJ	0.52	4.3	ug/Kg	IC
SS	NDA109	N	SW8081	SW3550	endrin	4.3	U	4.3	UJ	0.52	4.3	ug/Kg	IC
SB	NDA108	N	SW8081	SW3550	endrin	4.4	U	4.4	UJ	0.53	4.4	ug/Kg	IC
SB	NDA110	N	SW8081	SW3550	endrin	4.4	U	4.4	UJ	0.53	4.4	ug/Kg	IC
SS	NDA101	N	SW8081	SW3550	endrin	4.4	U	4.4	UJ	0.53	4.4	ug/Kg	IC
SS	NDA111	N	SW8081	SW3550	endrin	4.4	U	4.4	UJ	0.53	4.4	ug/Kg	IC
SS	NDA103	N	SW8081	SW3550	endrin	4.5	U	4.5	UJ	0.55	4.5	ug/Kg	IC
SB	NDA102	N	SW8081	SW3550	endrin	5.2	U	5.2	UJ	0.62	5.2	ug/Kg	IC
SB	NDA105	N	SW8081	SW3550	endrin	5.3	U	5.3	UJ	0.63	5.3	ug/Kg	IC
WS	NDW06FD02P-R01	FD	SW8081	SW3510	gamma bhc (lindane)	0.01	U	0.01	UJ	0.0019	0.010	ug/L	IC
WG	NDA0321FD1	FD	SW8081	SW3510	gamma bhc (lindane)	0.01	U	0.01	UJ	0.010	0.010	ug/L	IC
WS	NDW06SW06-R01	N	SW8081	SW3510	gamma bhc (lindane)	0.0099	U	0.0099	UJ	0.0019	0.0099	ug/L	IC
WS	NDW06SW10K-R01	N	SW8081	SW3510	gamma bhc (lindane)	0.0099	U	0.0099	UJ	0.0019	0.0099	ug/L	IC
WS	NDW06SW03-R01	N	SW8081	SW3510	gamma bhc (lindane)	0.01	U	0.01	UJ	0.0019	0.010	ug/L	IC
WS	NDW06SW05-R01	N	SW8081	SW3510	gamma bhc (lindane)	0.01	U	0.01	UJ	0.0019	0.010	ug/L	IC
WS	NDW06SW09-R01	N	SW8081	SW3510	gamma bhc (lindane)	0.01	U	0.01	UJ	0.0019	0.010	ug/L	IC
WS	NDW06SW11K-R01	N	SW8081	SW3510	gamma bhc (lindane)	0.01	U	0.01	UJ	0.0019	0.010	ug/L	IC
WS	NDW06SW07-R01	N	SW8081	SW3510	gamma bhc (lindane)	0.01	U	0.01	UJ	0.0020	0.010	ug/L	IC
WS	NDW06SW08-R01	N	SW8081	SW3510	gamma bhc (lindane)	0.01	U	0.01	UJ	0.0020	0.010	ug/L	IC
WG	NDA005	N	SW8081	SW3510	gamma bhc (lindane)	0.01	U	0.01	UJ	0.010	0.010	ug/L	IC
WG	NDA006	N	SW8081	SW3510	gamma bhc (lindane)	0.01	U	0.01	UJ	0.010	0.010	ug/L	IC
WG	NDA009	N	SW8081	SW3510	gamma bhc (lindane)	0.01	U	0.01	UJ	0.010	0.010	ug/L	IC
WG	NDA010	N	SW8081	SW3510	gamma bhc (lindane)	0.01	U	0.01	UJ	0.010	0.010	ug/L	IC
WG	NDA011	N	SW8081	SW3510	gamma bhc (lindane)	0.01	U	0.01	UJ	0.010	0.010	ug/L	IC
WG	NDA012	N	SW8081	SW3510	gamma bhc (lindane)	0.01	U	0.01	UJ	0.010	0.010	ug/L	IC
WG	NDA022	N	SW8081	SW3510	p,p'-DDT	0.02	U	0.02	UJ	0.010	0.020	ug/L	IC
WG	NDA0321FD1	FD	SW8260B	SW5030	2-butanone (MEK)	10	U	10	R	2.0	10.0	ug/L	IC, CC
WG	NDA0321FD1	FD	SW8260B	SW5030	Acetone	10	U	10	R	10.0	10.0	ug/L	IC, CC
SS	NDA115DL1	LR	E200.7	SW3050	Calcium	68800	=	68800	J	2.7	2280	mg/Kg	LD
SS	NDA117DL1	LR	E200.7	SW3050	Calcium	69700	=	69700	J	2.9	2520	mg/Kg	LD
SB	NDA116DL1	LR	E200.7	SW3050	Calcium	114000	=	114000	J	7.4	6310	mg/Kg	LD
SB	NDA118DL1	LR	E200.7	SW3050	Calcium	104000	=	104000	J	7.5	6450	mg/Kg	LD
SB	NDA114DL1	LR	E200.7	SW3050	Calcium	102000	=	102000	J	7.6	6510	mg/Kg	MD
SS	NDA104FD1	FD	E200.7	SW3050	Antimony	0.24	J	0.24	J	0.20	17.2	mg/Kg	MS
SB	NDA106FD1	FD	E200.7	SW3050	Antimony	0.5	J	0.5	J	0.23	19.4	mg/Kg	MS
SD	NDA307FD1	FD	E200.7	SW3050	Antimony	0.66	U	0.66	UJ	0.66	56.9	mg/Kg	MS
SD	NDA302	N	E200.7	SW3050	Antimony	0.14	U	0.14	UJ	0.14	12.0	mg/Kg	MS
SS	NDA115	N	E200.7	SW3050	Antimony	0.34	J	0.34	J	0.16	13.7	mg/Kg	MS
SS	NDA113	N	E200.7	SW3050	Antimony	0.74	J	0.74	J	0.17	14.9	mg/Kg	MS
SS	NDA107	N	E200.7	SW3050	Antimony	1	J	1	J	0.17	15.0	mg/Kg	MS
SB	NDA116	N	E200.7	SW3050	Antimony	0.18	U	0.18	UJ	0.18	15.1	mg/Kg	MS

EXHIBIT 4
Change in Qualifier Through the Data Validation Process

Matrix	Sample ID	Sample Type	Analytical Method	Prep Method	Parameter	Lab Result	Lab Qual	Final Result	Final Qual	DL	RL	Units	DV Notes
SS	NDA117	N	E200.7	SW3050	Antimony	0.46	J	0.46	J	0.18	15.1	mg/Kg	MS
SB	NDA118	N	E200.7	SW3050	Antimony	0.18	U	0.18	UJ	0.18	15.5	mg/Kg	MS
SB	NDA114	N	E200.7	SW3050	Antimony	0.46	J	0.46	J	0.18	15.6	mg/Kg	MS
SS	NDA109	N	E200.7	SW3050	Antimony	0.47	J	0.47	J	0.18	15.7	mg/Kg	MS
SB	NDA110	N	E200.7	SW3050	Antimony	0.53	J	0.53	J	0.19	16.0	mg/Kg	MS
SB	NDA112	N	E200.7	SW3050	Antimony	0.19	U	0.19	UJ	0.19	16.1	mg/Kg	MS
SB	NDA108	N	E200.7	SW3050	Antimony	0.93	J	0.93	J	0.19	16.2	mg/Kg	MS
SS	NDA101	N	E200.7	SW3050	Antimony	13.3	J	13.3	J	0.19	16.2	mg/Kg	MS
SS	NDA111	N	E200.7	SW3050	Antimony	0.82	J	0.82	J	0.19	16.3	mg/Kg	MS
SS	NDA103	N	E200.7	SW3050	Antimony	0.19	U	0.19	UJ	0.19	16.6	mg/Kg	MS
SD	NDA043	N	E200.7	SW3050	Antimony	97.8	=	97.8	J	0.21	17.8	mg/Kg	MS
SB	NDA102	N	E200.7	SW3050	Antimony	4.1	J	4.1	J	0.22	18.8	mg/Kg	MS
SB	NDA105	N	E200.7	SW3050	Antimony	0.61	J	0.61	J	0.23	19.5	mg/Kg	MS
SD	NDA042	N	E200.7	SW3050	Antimony	0.72	J	0.72	J	0.23	20.0	mg/Kg	MS
SD	NDA045	N	E200.7	SW3050	Antimony	0.5	U	0.5	UJ	0.50	43.0	mg/Kg	MS
SD	NDA046	N	E200.7	SW3050	Antimony	0.56	U	0.56	UJ	0.56	48.4	mg/Kg	MS
SD	NDA303	N	E200.7	SW3050	Antimony	0.62	U	0.62	UJ	0.62	53.1	mg/Kg	MS
SD	NDA044	N	E200.7	SW3050	Antimony	0.85	J	0.85	J	0.66	56.6	mg/Kg	MS
SS	NDA115	N	E200.7	SW3050	Copper	52.3	=	52.3	J	0.22	5.7	mg/Kg	MS
SS	NDA113	N	E200.7	SW3050	Copper	114	=	114	J	0.24	6.2	mg/Kg	MS
SB	NDA116	N	E200.7	SW3050	Copper	37.1	=	37.1	J	0.24	6.3	mg/Kg	MS
SS	NDA117	N	E200.7	SW3050	Copper	114	=	114	J	0.24	6.3	mg/Kg	MS
SB	NDA114	N	E200.7	SW3050	Copper	137	=	137	J	0.25	6.5	mg/Kg	MS
SB	NDA118	N	E200.7	SW3050	Copper	10	=	10	J	0.25	6.5	mg/Kg	MS
WG	NDA0321FD1	FD	E200.7	FLDFLT	Iron	12.2	U	12.2	R	12.2	100	ug/L	MS
WG	NDA005	N	E200.7	FLDFLT	Iron	12.2	U	12.2	R	12.2	100	ug/L	MS
WG	NDA006	N	E200.7	FLDFLT	Iron	12.2	U	12.2	R	12.2	100	ug/L	MS
WG	NDA008	N	E200.7	FLDFLT	Iron	12.7	J	12.7	J	12.2	100	ug/L	MS
WG	NDA009	N	E200.7	FLDFLT	Iron	12.2	U	12.2	R	12.2	100	ug/L	MS
WG	NDA010	N	E200.7	FLDFLT	Iron	944	=	944	J	12.2	100	ug/L	MS
WG	NDA011	N	E200.7	FLDFLT	Iron	70.5	J	70.5	J	12.2	100	ug/L	MS
WG	NDA012	N	E200.7	FLDFLT	Iron	12.2	U	12.2	R	12.2	100	ug/L	MS
WG	NDA0321FD1	FD	E200.7	SW3050	Iron	2240	=	2240	J	12.2	100	ug/L	MS
WG	NDA005	N	E200.7	SW3050	Iron	55.5	J	55.5	J	12.2	100	ug/L	MS
WG	NDA006	N	E200.7	SW3050	Iron	324	=	324	J	12.2	100	ug/L	MS
WG	NDA008	N	E200.7	SW3050	Iron	2500	=	2500	J	12.2	100	ug/L	MS
WG	NDA009	N	E200.7	SW3050	Iron	43	J	43	J	12.2	100	ug/L	MS
WG	NDA010	N	E200.7	SW3050	Iron	7320	=	7320	J	12.2	100	ug/L	MS
WG	NDA011	N	E200.7	SW3050	Iron	1460	=	1460	J	12.2	100	ug/L	MS
WG	NDA012	N	E200.7	SW3050	Iron	4170	=	4170	J	12.2	100	ug/L	MS
SS	NDA115	N	E200.7	SW3050	Manganese	390	=	390	J	0.010	3.4	mg/Kg	MS
SS	NDA113	N	E200.7	SW3050	Manganese	465	=	465	J	0.010	3.7	mg/Kg	MS
SB	NDA116	N	E200.7	SW3050	Manganese	213	=	213	J	0.010	3.8	mg/Kg	MS
SS	NDA117	N	E200.7	SW3050	Manganese	379	=	379	J	0.010	3.8	mg/Kg	MS
SB	NDA114	N	E200.7	SW3050	Manganese	343	=	343	J	0.010	3.9	mg/Kg	MS

EXHIBIT 4
Change in Qualifier Through the Data Validation Process

Matrix	Sample ID	Sample Type	Analytical Method	Prep Method	Parameter	Lab Result	Lab Qual	Final Result	Final Qual	DL	RL	Units	DV Notes
SB	NDA118	N	E200.7	SW3050	Manganese	170	=	170	J	0.010	3.9	mg/Kg	MS
SS	NDA107	N	E200.7	SW3050	Potassium	1820	=	1820	J	3.3	1250	mg/Kg	MS
SS	NDW06FD04P-R01	FD	SW6010B	SW3050B	Antimony	0.861	B	0.861	J	0.14	14.8	mg/Kg	MS
SS	NDW06SS19-R01	N	SW6010B	SW3050B	Antimony	0.448	B	0.448	J	0.11	11.5	mg/Kg	MS
SD	NDW06SD10-R01	N	SW6010B	SW3050B	Antimony	0.933	B	0.933	J	0.11	12.2	mg/Kg	MS
SS	NDW06SS22-R01	N	SW6010B	SW3050B	Antimony	0.516	B	0.516	J	0.12	12.9	mg/Kg	MS
SS	NDW06SS23-R01	N	SW6010B	SW3050B	Antimony	2.19	B	2.19	J	0.12	12.9	mg/Kg	MS
SS	NDW06SS13-R01	N	SW6010B	SW3050B	Antimony	2.96	B	2.96	J	0.12	13.0	mg/Kg	MS
SS	NDW06SS21-R01	N	SW6010B	SW3050B	Antimony	0.702	B	0.702	J	0.12	13.1	mg/Kg	MS
SS	NDW06SS10-R01	N	SW6010B	SW3050B	Antimony	0.465	B	0.465	J	0.12	13.4	mg/Kg	MS
SS	NDW06SS09-R01	N	SW6010B	SW3050B	Antimony	0.606	B	0.606	J	0.13	13.6	mg/Kg	MS
SD	NDW06SD12-R01	N	SW6010B	SW3050B	Antimony	0.564	B	0.564	J	0.13	13.9	mg/Kg	MS
SS	NDW06SS11-R01	N	SW6010B	SW3050B	Antimony	0.468	B	0.468	J	0.14	14.8	mg/Kg	MS
SS	NDW06SS12-R01	N	SW6010B	SW3050B	Antimony	0.862	B	0.862	J	0.14	15.4	mg/Kg	MS
SS	NDW06SS18-R01	N	SW6010B	SW3050B	Antimony	0.174	B	0.174	J	0.14	15.4	mg/Kg	MS
SS	NDW06SS20-R01	N	SW6010B	SW3050B	Antimony	0.443	B	0.443	J	0.14	15.5	mg/Kg	MS
SS	NDW06SS17-R01	N	SW6010B	SW3050B	Antimony	0.15	U	0.15	UJ	0.15	16.3	mg/Kg	MS
SS	NDW06SS14-R01	N	SW6010B	SW3050B	Antimony	0.76	B	0.76	J	0.16	17.1	mg/Kg	MS
SS	NDW06SS15-R01	N	SW6010B	SW3050B	Antimony	0.171	U	0.171	UJ	0.17	18.5	mg/Kg	MS
SS	NDW06SS16-R01	N	SW6010B	SW3050B	Antimony	0.178	U	0.178	UJ	0.18	19.3	mg/Kg	MS
SD	NDW06SD06-R01	N	SW6010B	SW3050B	Antimony	0.312	B	0.312	J	0.21	22.4	mg/Kg	MS
SD	NDW06SD09-R01	N	SW6010B	SW3050B	Antimony	0.871	B	0.871	J	0.25	26.5	mg/Kg	MS
SD	NDW06SD08-R01	N	SW6010B	SW3050B	Antimony	0.602	B	0.602	J	0.27	29.0	mg/Kg	MS
SD	NDW06SD07-R01	N	SW6010B	SW3050B	Antimony	0.766	B	0.766	J	0.29	31.5	mg/Kg	MS
SS	NDW06FD04P-R01	FD	SW6010B	SW3050B	Arsenic	1.14	B	1.14	J	0.20	2.5	mg/Kg	MS
SS	NDW06SS19-R01	N	SW6010B	SW3050B	Arsenic	1.01	B	1.01	J	0.16	1.9	mg/Kg	MS
SS	NDW06SS22-R01	N	SW6010B	SW3050B	Arsenic	0.963	B	0.963	J	0.17	2.1	mg/Kg	MS
SS	NDW06SS23-R01	N	SW6010B	SW3050B	Arsenic	7.9	=	7.9	J	0.18	2.2	mg/Kg	MS
SS	NDW06SS13-R01	N	SW6010B	SW3050B	Arsenic	3.09	=	3.09	J	0.18	2.2	mg/Kg	MS
SS	NDW06SS21-R01	N	SW6010B	SW3050B	Arsenic	0.765	B	0.765	J	0.18	2.2	mg/Kg	MS
SS	NDW06SS10-R01	N	SW6010B	SW3050B	Arsenic	1.48	B	1.48	J	0.18	2.2	mg/Kg	MS
SS	NDW06SS09-R01	N	SW6010B	SW3050B	Arsenic	1.32	B	1.32	J	0.18	2.3	mg/Kg	MS
SS	NDW06SS11-R01	N	SW6010B	SW3050B	Arsenic	0.48	B	0.48	J	0.20	2.5	mg/Kg	MS
SS	NDW06SS12-R01	N	SW6010B	SW3050B	Arsenic	0.623	B	0.623	J	0.21	2.6	mg/Kg	MS
SS	NDW06SS18-R01	N	SW6010B	SW3050B	Arsenic	0.635	B	0.635	J	0.21	2.6	mg/Kg	MS
SS	NDW06SS20-R01	N	SW6010B	SW3050B	Arsenic	0.566	B	0.566	J	0.21	2.6	mg/Kg	MS
SS	NDW06SS17-R01	N	SW6010B	SW3050B	Arsenic	0.598	B	0.598	J	0.22	2.7	mg/Kg	MS
SS	NDW06SS14-R01	N	SW6010B	SW3050B	Arsenic	1.12	B	1.12	J	0.23	2.8	mg/Kg	MS
SS	NDW06SS15-R01	N	SW6010B	SW3050B	Arsenic	0.912	B	0.912	J	0.25	3.1	mg/Kg	MS
SS	NDW06SS16-R01	N	SW6010B	SW3050B	Arsenic	1.17	B	1.17	J	0.26	3.2	mg/Kg	MS
WG	NDW06GW04-R01	N	SW7470A	FLDFLT	Mercury	0.0241	B	0.0241	J	0.016	0.20	ug/L	MS
WG	NDW08GW07-R01	N	SW7470A	FLDFLT	Mercury	0.0464	B	0.0464	J	0.016	0.20	ug/L	MS
WG	NDW06GW08-R01	N	SW7470A	FLDFLT	Mercury	0.0162	U	0.0162	UJ	0.016	0.20	ug/L	MS
WS	NDA038FD1	FD	SW7470A	METHOD	Mercury	0.18	U	0.18	R	0.18	0.20	ug/L	MS
WS	NDA035	N	SW7470A	METHOD	Mercury	0.18	U	0.18	R	0.18	0.20	ug/L	MS

EXHIBIT 4
Change in Qualifier Through the Data Validation Process

Matrix	Sample ID	Sample Type	Analytical Method	Prep Method	Parameter	Lab Result	Lab Qual	Final Result	Final Qual	DL	RL	Units	DV Notes
WS	NDA036	N	SW7470A	METHOD	Mercury	0.18	U	0.18	R	0.18	0.20	ug/L	MS
WS	NDA037	N	SW7470A	METHOD	Mercury	1.6	=	1.6	J	0.18	0.20	ug/L	MS
WS	NDA039	N	SW7470A	METHOD	Mercury	0.18	U	0.18	R	0.18	0.20	ug/L	MS
WS	NDA040	N	SW7470A	METHOD	Mercury	0.18	U	0.18	R	0.18	0.20	ug/L	MS
WS	NDA300	N	SW7470A	METHOD	Mercury	0.18	U	0.18	R	0.18	0.20	ug/L	MS
WS	NDA301	N	SW7470A	METHOD	Mercury	0.18	U	0.18	R	0.18	0.20	ug/L	MS
SS	NDA104FD1	FD	SW7471A	METHOD	Mercury	0.019	U	0.019	UJ	0.010	0.060	mg/Kg	MS
SB	NDA106FD1	FD	SW7471A	METHOD	Mercury	0.023	U	0.023	UJ	0.020	0.070	mg/Kg	MS
SD	NDA307FD1	FD	SW7471A	METHOD	Mercury	0.048	U	0.048	UJ	0.040	0.16	mg/Kg	MS
SD	NDA302	N	SW7471A	METHOD	Mercury	0.0087	U	0.0087	UJ	0.0087	0.020	mg/Kg	MS
SB	NDA110	N	SW7471A	METHOD	Mercury	0.012	U	0.012	UJ	0.010	0.030	mg/Kg	MS
SB	NDA108	N	SW7471A	METHOD	Mercury	0.072	=	0.072	J	0.010	0.050	mg/Kg	MS
SB	NDA112	N	SW7471A	METHOD	Mercury	0.018	U	0.018	UJ	0.010	0.050	mg/Kg	MS
SD	NDA043	N	SW7471A	METHOD	Mercury	0.21	=	0.21	J	0.010	0.050	mg/Kg	MS
SS	NDA103	N	SW7471A	METHOD	Mercury	0.015	U	0.015	UJ	0.010	0.050	mg/Kg	MS
SS	NDA107	N	SW7471A	METHOD	Mercury	0.081	=	0.081	J	0.010	0.050	mg/Kg	MS
SB	NDA102	N	SW7471A	METHOD	Mercury	0.053	J	0.053	J	0.010	0.060	mg/Kg	MS
SD	NDA042	N	SW7471A	METHOD	Mercury	0.18	=	0.18	J	0.010	0.060	mg/Kg	MS
SS	NDA101	N	SW7471A	METHOD	Mercury	0.081	=	0.081	J	0.010	0.060	mg/Kg	MS
SS	NDA109	N	SW7471A	METHOD	Mercury	0.019	U	0.019	UJ	0.010	0.060	mg/Kg	MS
SS	NDA111	N	SW7471A	METHOD	Mercury	0.038	J	0.038	J	0.010	0.060	mg/Kg	MS
SB	NDA105	N	SW7471A	METHOD	Mercury	0.042	J	0.042	J	0.020	0.060	mg/Kg	MS
SD	NDA046	N	SW7471A	METHOD	Mercury	0.047	U	0.047	UJ	0.040	0.16	mg/Kg	MS
SD	NDA044	N	SW7471A	METHOD	Mercury	0.05	U	0.05	UJ	0.050	0.17	mg/Kg	MS
SD	NDA045	N	SW7471A	METHOD	Mercury	0.052	U	0.052	UJ	0.050	0.17	mg/Kg	MS
SD	NDA303	N	SW7471A	METHOD	Mercury	0.052	U	0.052	UJ	0.050	0.17	mg/Kg	MS
WS	NDW06SW08-R01	N	SW8081	SW3510	Aldrin	0.01	U	0.01	UJ	0.0021	0.010	ug/L	MS
WS	NDW06SW08-R01	N	SW8081	SW3510	endrin	0.021	U	0.021	UJ	0.0045	0.021	ug/L	MS
WS	NDW06SW08-R01	N	SW8081	SW3510	heptachlor	0.01	U	0.01	UJ	0.0023	0.010	ug/L	MS
WS	NDW06SW08-R01	N	SW8081	SW3510	p,p'-DDT	0.021	U	0.021	UJ	0.0045	0.021	ug/L	MS
SD	NDW06SD08-R01	N	SW8082	SW3550	Aroclor-1016	110	U	110	UJ	3.5	110	ug/Kg	MS
SD	NDW06SD08-R01	N	SW8082	SW3550	Aroclor-1260	110	U	110	UJ	1.5	110	ug/Kg	MS
SS	NDA107DL1	LR	E200.7	SW3050	Calcium	111000	=	111000	J	7.3	6240	mg/Kg	SD
SS	NDA109DL1	LR	E200.7	SW3050	Calcium	77800	=	77800	J	7.7	6560	mg/Kg	SD
SB	NDA110DL1	LR	E200.7	SW3050	Calcium	42600	=	42600	J	7.8	6650	mg/Kg	SD
SB	NDA112DL1	LR	E200.7	SW3050	Calcium	122000	=	122000	J	7.8	6700	mg/Kg	SD
SS	NDA101DL1	LR	E200.7	SW3050	Calcium	105000	=	105000	J	7.9	6760	mg/Kg	SD
SB	NDA108DL1	LR	E200.7	SW3050	Calcium	97600	=	97600	J	7.9	6770	mg/Kg	SD
SS	NDA111DL1	LR	E200.7	SW3050	Calcium	119000	=	119000	J	7.9	6780	mg/Kg	SD
SS	NDA103DL1	LR	E200.7	SW3050	Calcium	162000	=	162000	J	8.1	6930	mg/Kg	SD
SS	NDA104FD1DL1	LR	E200.7	SW3050	Calcium	163000	=	163000	J	8.4	7160	mg/Kg	SD
SB	NDA102DL1	LR	E200.7	SW3050	Calcium	96500	=	96500	J	9.2	7840	mg/Kg	SD
SB	NDA106FD1DL1	LR	E200.7	SW3050	Calcium	212000	=	212000	J	9.5	8090	mg/Kg	SD
SB	NDA105DL1	LR	E200.7	SW3050	Calcium	138000	=	138000	J	9.5	8140	mg/Kg	SD
WS	NDA035DL1	LR	E200.7	SW3050	Calcium	476000	=	476000	J	58.5	25000	ug/L	SD

EXHIBIT 4
Change in Qualifier Through the Data Validation Process

Matrix	Sample ID	Sample Type	Analytical Method	Prep Method	Parameter	Lab Result	Lab Qual	Final Result	Final Qual	DL	RL	Units	DV Notes
WS	NDA036DL1	LR	E200.7	SW3050	Calcium	463000	=	463000	J	58.5	25000	ug/L	SD
WS	NDA037DL1	LR	E200.7	SW3050	Calcium	464000	=	464000	J	58.5	25000	ug/L	SD
WS	NDA038FD1DL1	LR	E200.7	SW3050	Calcium	455000	=	455000	J	58.5	25000	ug/L	SD
WS	NDA039DL1	LR	E200.7	SW3050	Calcium	465000	=	465000	J	58.5	25000	ug/L	SD
WS	NDA040DL1	LR	E200.7	SW3050	Calcium	470000	=	470000	J	58.5	25000	ug/L	SD
WS	NDA300DL1	LR	E200.7	SW3050	Calcium	469000	=	469000	J	58.5	25000	ug/L	SD
WS	NDA301DL1	LR	E200.7	SW3050	Calcium	487000	=	487000	J	58.5	25000	ug/L	SD
SS	NDA113	N	E200.7	SW3050	Calcium	35400	=	35400	J	1.5	1240	mg/Kg	SD
WS	NDA038FD1	FD	E200.7	SW3050	Iron	756	=	756	J	12.2	100	ug/L	SD
WS	NDA035	N	E200.7	SW3050	Iron	887	=	887	J	12.2	100	ug/L	SD
WS	NDA036	N	E200.7	SW3050	Iron	700	=	700	J	12.2	100	ug/L	SD
WS	NDA037	N	E200.7	SW3050	Iron	761	=	761	J	12.2	100	ug/L	SD
WS	NDA039	N	E200.7	SW3050	Iron	883	=	883	J	12.2	100	ug/L	SD
WS	NDA040	N	E200.7	SW3050	Iron	614	=	614	J	12.2	100	ug/L	SD
WS	NDA300	N	E200.7	SW3050	Iron	979	=	979	J	12.2	100	ug/L	SD
WS	NDA301	N	E200.7	SW3050	Iron	1410	=	1410	J	12.2	100	ug/L	SD
WS	NDA038FD1	FD	E200.7	SW3050	Manganese	17.2	=	17.2	J	0.10	15.0	ug/L	SD
WS	NDA035	N	E200.7	SW3050	Manganese	25.7	=	25.7	J	0.10	15.0	ug/L	SD
WS	NDA036	N	E200.7	SW3050	Manganese	19.8	=	19.8	J	0.10	15.0	ug/L	SD
WS	NDA037	N	E200.7	SW3050	Manganese	18.1	=	18.1	J	0.10	15.0	ug/L	SD
WS	NDA039	N	E200.7	SW3050	Manganese	18.9	=	18.9	J	0.10	15.0	ug/L	SD
WS	NDA040	N	E200.7	SW3050	Manganese	5.3	J	5.3	J	0.10	15.0	ug/L	SD
WS	NDA300	N	E200.7	SW3050	Manganese	21.3	=	21.3	J	0.10	15.0	ug/L	SD
WS	NDA301	N	E200.7	SW3050	Manganese	30.8	=	30.8	J	0.10	15.0	ug/L	SD
WG	NDA0321FD1	FD	E200.7	FLDFLT	Potassium	3630	J	3630	J	26.6	5000	ug/L	SD
WG	NDA022	N	E200.7	FLDFLT	Potassium	4120	J	4120	J	26.6	5000	ug/L	SD
WG	NDA010	N	E200.7	FLDFLT	Potassium	2280	J	2280	J	26.6	5000	ug/L	SD
WG	NDA011	N	E200.7	FLDFLT	Potassium	3520	J	3520	J	26.6	5000	ug/L	SD
WG	NDA012	N	E200.7	FLDFLT	Potassium	2000	J	2000	J	26.6	5000	ug/L	SD
SS	NDA104FD1	FD	E200.7	SW3050	Potassium	2300	=	2300	J	3.8	1430	mg/Kg	SD
SB	NDA106FD1	FD	E200.7	SW3050	Potassium	2740	=	2740	J	4.3	1620	mg/Kg	SD
WG	NDA0321FD1	FD	E200.7	SW3050	Potassium	3600	J	3600	J	26.6	5000	ug/L	SD
SS	NDA109	N	E200.7	SW3050	Potassium	2700	=	2700	J	3.5	1310	mg/Kg	SD
SB	NDA110	N	E200.7	SW3050	Potassium	2510	=	2510	J	3.5	1330	mg/Kg	SD
SB	NDA112	N	E200.7	SW3050	Potassium	1590	=	1590	J	3.6	1340	mg/Kg	SD
SB	NDA108	N	E200.7	SW3050	Potassium	1810	=	1810	J	3.6	1350	mg/Kg	SD
SS	NDA101	N	E200.7	SW3050	Potassium	1740	=	1740	J	3.6	1350	mg/Kg	SD
SS	NDA111	N	E200.7	SW3050	Potassium	2610	=	2610	J	3.6	1360	mg/Kg	SD
SS	NDA103	N	E200.7	SW3050	Potassium	1900	=	1900	J	3.7	1390	mg/Kg	SD
SB	NDA102	N	E200.7	SW3050	Potassium	2630	=	2630	J	4.2	1570	mg/Kg	SD
SB	NDA105	N	E200.7	SW3050	Potassium	2670	=	2670	J	4.3	1630	mg/Kg	SD
WG	NDA022	N	E200.7	SW3050	Potassium	5650	=	5650	J	26.6	5000	ug/L	SD
WG	NDA010	N	E200.7	SW3050	Potassium	2770	J	2770	J	26.6	5000	ug/L	SD
WG	NDA011	N	E200.7	SW3050	Potassium	3560	J	3560	J	26.6	5000	ug/L	SD
WG	NDA012	N	E200.7	SW3050	Potassium	2320	J	2320	J	26.6	5000	ug/L	SD

EXHIBIT 4
Change in Qualifier Through the Data Validation Process

Matrix	Sample ID	Sample Type	Analytical Method	Prep Method	Parameter	Lab Result	Lab Qual	Final Result	Final Qual	DL	RL	Units	DV Notes
WS	NDA035DL2	LR	E200.7	SW3050	Sodium	11900000	=	11900000	J	11500	500000	ug/L	SD
WS	NDA036DL2	LR	E200.7	SW3050	Sodium	11500000	=	11500000	J	11500	500000	ug/L	SD
WS	NDA037DL2	LR	E200.7	SW3050	Sodium	11600000	=	11600000	J	11500	500000	ug/L	SD
WS	NDA038FD1DL2	LR	E200.7	SW3050	Sodium	11300000	=	11300000	J	11500	500000	ug/L	SD
WS	NDA039DL2	LR	E200.7	SW3050	Sodium	11700000	=	11700000	J	11500	500000	ug/L	SD
WS	NDA040DL2	LR	E200.7	SW3050	Sodium	11500000	=	11500000	J	11500	500000	ug/L	SD
WS	NDA300DL2	LR	E200.7	SW3050	Sodium	11600000	=	11600000	J	11500	500000	ug/L	SD
WS	NDA301DL2	LR	E200.7	SW3050	Sodium	12100000	=	12100000	J	11500	500000	ug/L	SD
WG	NDW06GW04-R01	N	SW6010B	SW3010A	Barium	166	B	166	J	9.8	4000	ug/L	SD
WG	NDW06GW08-R01	N	SW6010B	SW3010A	Barium	131	B	131	J	9.8	4000	ug/L	SD
WG	NDW06GW07-R01	N	SW6010B	SW3010A	Barium	147	B	147	J	12.3	5000	ug/L	SD
WS	NDW06FD02P-R01	FD	SW6010B	FLDFLT	Calcium	408000	=	408000	J	650	100000	ug/L	SD
WS	NDW06SW02-R01	N	SW6010B	FLDFLT	Calcium	419000	=	419000	J	650	100000	ug/L	SD
WS	NDW06SW03-R01	N	SW6010B	FLDFLT	Calcium	413000	=	413000	J	650	100000	ug/L	SD
WS	NDW06SW05-R01	N	SW6010B	FLDFLT	Calcium	403000	=	403000	J	650	100000	ug/L	SD
WS	NDW06SW06-R01	N	SW6010B	FLDFLT	Calcium	409000	=	409000	J	650	100000	ug/L	SD
WS	NDW06SW07-R01	N	SW6010B	FLDFLT	Calcium	403000	=	403000	J	650	100000	ug/L	SD
WS	NDW06SW08-R01	N	SW6010B	FLDFLT	Calcium	412000	=	412000	J	650	100000	ug/L	SD
WS	NDW06SW09-R01	N	SW6010B	FLDFLT	Calcium	397000	=	397000	J	650	100000	ug/L	SD
WS	NDW06SW10K-R01	N	SW6010B	FLDFLT	Calcium	482000	=	482000	J	650	100000	ug/L	SD
WS	NDW06SW11K-R01	N	SW6010B	FLDFLT	Calcium	459000	=	459000	J	650	100000	ug/L	SD
SD	NDW06SD10-R01	N	SW6010B	SW3050B	Cobalt	1.86	B	1.86	J	0.039	10.2	mg/Kg	SD
SD	NDW06SD12-R01	N	SW6010B	SW3050B	Cobalt	2.65	B	2.65	J	0.045	11.6	mg/Kg	SD
SD	NDW06SD06-R01	N	SW6010B	SW3050B	Cobalt	7.58	B	7.58	J	0.072	18.7	mg/Kg	SD
SD	NDW06SD16K-R01	N	SW6010B	SW3050B	Cobalt	1.26	B	1.26	J	0.070	19.2	mg/Kg	SD
SD	NDW06SD15K-R01	N	SW6010B	SW3050B	Cobalt	2.35	B	2.35	J	0.070	19.5	mg/Kg	SD
SD	NDW06SD09-R01	N	SW6010B	SW3050B	Cobalt	5.96	B	5.96	J	0.085	22.1	mg/Kg	SD
SD	NDW06SD08-R01	N	SW6010B	SW3050B	Cobalt	12.2	B	12.2	J	0.093	24.2	mg/Kg	SD
SD	NDW06SD07-R01	N	SW6010B	SW3050B	Cobalt	10.4	B	10.4	J	0.10	26.3	mg/Kg	SD
WG	NDW06FD01P-R01	FD	SW6010B	FLDFLT	Iron	532	B	532	J	167	1000	ug/L	SD
WG	NDW06GW02-R01	N	SW6010B	FLDFLT	Iron	2320	=	2320	J	167	1000	ug/L	SD
WG	NDW06GW03-R01	N	SW6010B	FLDFLT	Iron	5230	=	5230	J	167	1000	ug/L	SD
WG	NDW06GW05-R01	N	SW6010B	FLDFLT	Iron	338	B	338	J	167	1000	ug/L	SD
WS	NDW06FD02P-R01	FD	SW6010B	FLDFLT	Magnesium	1250000	=	1250000	J	105	100000	ug/L	SD
WS	NDW06SW02-R01	N	SW6010B	FLDFLT	Magnesium	1270000	=	1270000	J	105	100000	ug/L	SD
WS	NDW06SW03-R01	N	SW6010B	FLDFLT	Magnesium	1250000	=	1250000	J	105	100000	ug/L	SD
WS	NDW06SW05-R01	N	SW6010B	FLDFLT	Magnesium	1230000	=	1230000	J	105	100000	ug/L	SD
WS	NDW06SW06-R01	N	SW6010B	FLDFLT	Magnesium	1250000	=	1250000	J	105	100000	ug/L	SD
WS	NDW06SW07-R01	N	SW6010B	FLDFLT	Magnesium	1240000	=	1240000	J	105	100000	ug/L	SD
WS	NDW06SW08-R01	N	SW6010B	FLDFLT	Magnesium	1240000	=	1240000	J	105	100000	ug/L	SD
WS	NDW06SW09-R01	N	SW6010B	FLDFLT	Magnesium	1220000	=	1220000	J	105	100000	ug/L	SD
WS	NDW06SW10K-R01	N	SW6010B	FLDFLT	Magnesium	1460000	=	1460000	J	105	100000	ug/L	SD
WS	NDW06SW11K-R01	N	SW6010B	FLDFLT	Magnesium	1390000	=	1390000	J	105	100000	ug/L	SD
SS	NDW06FD04P-R01	FD	SW6010B	SW3050B	Magnesium	3110	=	3110	J	1.6	1240	mg/Kg	SD
SS	NDW06SS19-R01	N	SW6010B	SW3050B	Magnesium	2800	=	2800	J	1.3	958	mg/Kg	SD

EXHIBIT 4
Change in Qualifier Through the Data Validation Process

Matrix	Sample ID	Sample Type	Analytical Method	Prep Method	Parameter	Lab Result	Lab Qual	Final Result	Final Qual	DL	RL	Units	DV Notes
SS	NDW06SS22-R01	N	SW6010B	SW3050B	Magnesium	3690	=	3690	J	1.4	1070	mg/Kg	SD
SS	NDW06SS23-R01	N	SW6010B	SW3050B	Magnesium	2690	=	2690	J	1.4	1080	mg/Kg	SD
SS	NDW06SS13-R01	N	SW6010B	SW3050B	Magnesium	3920	=	3920	J	1.4	1090	mg/Kg	SD
SS	NDW06SS21-R01	N	SW6010B	SW3050B	Magnesium	7830	=	7830	J	1.4	1090	mg/Kg	SD
SS	NDW06SS10-R01	N	SW6010B	SW3050B	Magnesium	2790	=	2790	J	1.5	1110	mg/Kg	SD
SS	NDW06SS09-R01	N	SW6010B	SW3050B	Magnesium	3310	=	3310	J	1.5	1140	mg/Kg	SD
SS	NDW06SS11-R01	N	SW6010B	SW3050B	Magnesium	1810	=	1810	J	1.6	1230	mg/Kg	SD
SS	NDW06SS12-R01	N	SW6010B	SW3050B	Magnesium	2270	=	2270	J	1.7	1280	mg/Kg	SD
SS	NDW06SS18-R01	N	SW6010B	SW3050B	Magnesium	2730	=	2730	J	1.7	1280	mg/Kg	SD
SS	NDW06SS20-R01	N	SW6010B	SW3050B	Magnesium	2670	=	2670	J	1.7	1290	mg/Kg	SD
SS	NDW06SS17-R01	N	SW6010B	SW3050B	Magnesium	2870	=	2870	J	1.8	1360	mg/Kg	SD
SS	NDW06SS14-R01	N	SW6010B	SW3050B	Magnesium	3110	=	3110	J	1.9	1420	mg/Kg	SD
SS	NDW06SS15-R01	N	SW6010B	SW3050B	Magnesium	3470	=	3470	J	2.0	1540	mg/Kg	SD
SS	NDW06SS16-R01	N	SW6010B	SW3050B	Magnesium	3690	=	3690	J	2.1	1610	mg/Kg	SD
SS	NDW06FD04P-R01	FD	SW6010B	SW3050B	Nickel	2.14	B	2.14	J	0.081	9.9	mg/Kg	SD
SS	NDW06SS19-R01	N	SW6010B	SW3050B	Nickel	2.9	B	2.9	J	0.063	7.7	mg/Kg	SD
SS	NDW06SS22-R01	N	SW6010B	SW3050B	Nickel	2.43	B	2.43	J	0.070	8.6	mg/Kg	SD
SS	NDW06SS23-R01	N	SW6010B	SW3050B	Nickel	12.3	=	12.3	J	0.070	8.6	mg/Kg	SD
SS	NDW06SS13-R01	N	SW6010B	SW3050B	Nickel	9.35	=	9.35	J	0.071	8.7	mg/Kg	SD
SS	NDW06SS21-R01	N	SW6010B	SW3050B	Nickel	10.3	=	10.3	J	0.072	8.8	mg/Kg	SD
SS	NDW06SS10-R01	N	SW6010B	SW3050B	Nickel	2.48	B	2.48	J	0.073	8.9	mg/Kg	SD
SS	NDW06SS09-R01	N	SW6010B	SW3050B	Nickel	1.85	B	1.85	J	0.074	9.1	mg/Kg	SD
SS	NDW06SS11-R01	N	SW6010B	SW3050B	Nickel	1.1	B	1.1	J	0.081	9.9	mg/Kg	SD
SS	NDW06SS12-R01	N	SW6010B	SW3050B	Nickel	2.07	B	2.07	J	0.084	10.2	mg/Kg	SD
SS	NDW06SS18-R01	N	SW6010B	SW3050B	Nickel	2.25	B	2.25	J	0.084	10.3	mg/Kg	SD
SS	NDW06SS20-R01	N	SW6010B	SW3050B	Nickel	1.34	B	1.34	J	0.084	10.3	mg/Kg	SD
SS	NDW06SS17-R01	N	SW6010B	SW3050B	Nickel	2.38	B	2.38	J	0.089	10.8	mg/Kg	SD
SS	NDW06SS14-R01	N	SW6010B	SW3050B	Nickel	2.88	B	2.88	J	0.093	11.4	mg/Kg	SD
SS	NDW06SS15-R01	N	SW6010B	SW3050B	Nickel	2.67	B	2.67	J	0.10	12.3	mg/Kg	SD
SS	NDW06SS16-R01	N	SW6010B	SW3050B	Nickel	3.15	B	3.15	J	0.11	12.9	mg/Kg	SD
WS	NDW06FD02P-R01	FD	SW6010B	FLDFLT	Potassium	661000	=	661000	J	230	100000	ug/L	SD
WS	NDW06SW02-R01	N	SW6010B	FLDFLT	Potassium	667000	=	667000	J	230	100000	ug/L	SD
WS	NDW06SW03-R01	N	SW6010B	FLDFLT	Potassium	663000	=	663000	J	230	100000	ug/L	SD
WS	NDW06SW05-R01	N	SW6010B	FLDFLT	Potassium	647000	=	647000	J	230	100000	ug/L	SD
WS	NDW06SW06-R01	N	SW6010B	FLDFLT	Potassium	660000	=	660000	J	230	100000	ug/L	SD
WS	NDW06SW07-R01	N	SW6010B	FLDFLT	Potassium	648000	=	648000	J	230	100000	ug/L	SD
WS	NDW06SW08-R01	N	SW6010B	FLDFLT	Potassium	652000	=	652000	J	230	100000	ug/L	SD
WS	NDW06SW09-R01	N	SW6010B	FLDFLT	Potassium	648000	=	648000	J	230	100000	ug/L	SD
WS	NDW06SW10K-R01	N	SW6010B	FLDFLT	Potassium	782000	=	782000	J	230	100000	ug/L	SD
WS	NDW06SW11K-R01	N	SW6010B	FLDFLT	Potassium	750000	=	750000	J	230	100000	ug/L	SD
SS	NDW06FD04P-R01	FD	SW6010B	SW3050B	Potassium	1780	=	1780	J	4.0	1240	mg/Kg	SD
SS	NDW06SS19-R01	N	SW6010B	SW3050B	Potassium	1900	=	1900	J	3.1	958	mg/Kg	SD
SS	NDW06SS22-R01	N	SW6010B	SW3050B	Potassium	1450	=	1450	J	3.5	1070	mg/Kg	SD
SS	NDW06SS23-R01	N	SW6010B	SW3050B	Potassium	1280	=	1280	J	3.5	1080	mg/Kg	SD
SS	NDW06SS13-R01	N	SW6010B	SW3050B	Potassium	1650	=	1650	J	3.5	1090	mg/Kg	SD

EXHIBIT 4
Change in Qualifier Through the Data Validation Process

Matrix	Sample ID	Sample Type	Analytical Method	Prep Method	Parameter	Lab Result	Lab Qual	Final Result	Final Qual	DL	RL	Units	DV Notes
SS	NDW06SS21-R01	N	SW6010B	SW3050B	Potassium	2700	=	2700	J	3.6	1090	mg/Kg	SD
SS	NDW06SS10-R01	N	SW6010B	SW3050B	Potassium	1320	=	1320	J	3.6	1110	mg/Kg	SD
SS	NDW06SS09-R01	N	SW6010B	SW3050B	Potassium	1820	=	1820	J	3.7	1140	mg/Kg	SD
SS	NDW06SS11-R01	N	SW6010B	SW3050B	Potassium	1570	=	1570	J	4.0	1230	mg/Kg	SD
SS	NDW06SS12-R01	N	SW6010B	SW3050B	Potassium	1720	=	1720	J	4.1	1280	mg/Kg	SD
SS	NDW06SS18-R01	N	SW6010B	SW3050B	Potassium	1970	=	1970	J	4.2	1280	mg/Kg	SD
SS	NDW06SS20-R01	N	SW6010B	SW3050B	Potassium	1620	=	1620	J	4.2	1290	mg/Kg	SD
SS	NDW06SS17-R01	N	SW6010B	SW3050B	Potassium	2230	=	2230	J	4.4	1360	mg/Kg	SD
SS	NDW06SS14-R01	N	SW6010B	SW3050B	Potassium	2320	=	2320	J	4.6	1420	mg/Kg	SD
SS	NDW06SS15-R01	N	SW6010B	SW3050B	Potassium	2580	=	2580	J	5.0	1540	mg/Kg	SD
SS	NDW06SS16-R01	N	SW6010B	SW3050B	Potassium	2890	=	2890	J	5.2	1610	mg/Kg	SD
WS	NDW06FD02P-R01	FD	SW6010B	FLDFLT	Sodium	10400000	=	10400000	J	454	100000	ug/L	SD
WS	NDW06SW02-R01	N	SW6010B	FLDFLT	Sodium	10400000	=	10400000	J	454	100000	ug/L	SD
WS	NDW06SW03-R01	N	SW6010B	FLDFLT	Sodium	10300000	=	10300000	J	454	100000	ug/L	SD
WS	NDW06SW05-R01	N	SW6010B	FLDFLT	Sodium	10100000	=	10100000	J	454	100000	ug/L	SD
WS	NDW06SW06-R01	N	SW6010B	FLDFLT	Sodium	10300000	=	10300000	J	454	100000	ug/L	SD
WS	NDW06SW07-R01	N	SW6010B	FLDFLT	Sodium	10100000	=	10100000	J	454	100000	ug/L	SD
WS	NDW06SW08-R01	N	SW6010B	FLDFLT	Sodium	10200000	=	10200000	J	454	100000	ug/L	SD
WS	NDW06SW09-R01	N	SW6010B	FLDFLT	Sodium	10300000	=	10300000	J	454	100000	ug/L	SD
WS	NDW06SW10K-R01	N	SW6010B	FLDFLT	Sodium	12100000	=	12100000	J	454	100000	ug/L	SD
WS	NDW06SW11K-R01	N	SW6010B	FLDFLT	Sodium	11700000	=	11700000	J	454	100000	ug/L	SD
WG	NDW06FD01P-R01DL	LR	SW6010B	SW3010A	Sodium	13500000	=	13500000	J	2270	500000	ug/L	SD
WG	NDW06GW01-R01DL	LR	SW6010B	SW3010A	Sodium	19200000	=	19200000	J	2270	500000	ug/L	SD
WG	NDW06GW02-R01DL	LR	SW6010B	SW3010A	Sodium	16100000	=	16100000	J	2270	500000	ug/L	SD
WG	NDW06GW03-R01DL	LR	SW6010B	SW3010A	Sodium	14600000	=	14600000	J	2270	500000	ug/L	SD
WG	NDW06GW05-R01DL	LR	SW6010B	SW3010A	Sodium	13500000	=	13500000	J	2270	500000	ug/L	SD
WG	NDW06GW06-R01DL	LR	SW6010B	SW3010A	Sodium	15400000	=	15400000	J	2270	500000	ug/L	SD
SD	NDW06FD03P-R01	FD	SW8081	SW3550	Aldrin	2.3	U	2.3	R	0.14	2.3	ug/Kg	SS
SS	NDW06SS11-R01	N	SW8081	SW3550	Aldrin	2.2	U	2.2	UJ	0.13	2.2	ug/Kg	SS
SD	NDW06SD14-R01	N	SW8081	SW3550	Aldrin	2.6	U	2.6	R	0.15	2.6	ug/Kg	SS
SD	NDW06SD06-R01	N	SW8081	SW3550	Aldrin	4.1	U	4.1	UJ	0.24	4.1	ug/Kg	SS
SD	NDW06SD16K-R01	N	SW8081	SW3550	Aldrin	4.2	U	4.2	UJ	0.25	4.2	ug/Kg	SS
SD	NDW06SD07-R01	N	SW8081	SW3550	Aldrin	5.5	U	5.5	R	0.32	5.5	ug/Kg	SS
WG	NDW06GW05-R01	N	SW8081	SW3510	Aldrin	0.01	U	0.01	R	0.0020	0.010	ug/L	SS
WS	NDW06SW02-R01	N	SW8081	SW3510	Aldrin	0.01	U	0.01	UJ	0.0020	0.010	ug/L	SS
WG	NDA008	N	SW8081	SW3510	Aldrin	0.01	U	0.01	UJ	0.010	0.010	ug/L	SS
SD	NDW06FD03P-R01	FD	SW8081	SW3550	alpha bhc	2.3	U	2.3	R	0.15	2.3	ug/Kg	SS
SS	NDW06SS11-R01	N	SW8081	SW3550	alpha bhc	2.2	U	2.2	UJ	0.14	2.2	ug/Kg	SS
SD	NDW06SD14-R01	N	SW8081	SW3550	alpha bhc	2.6	U	2.6	R	0.17	2.6	ug/Kg	SS
SD	NDW06SD06-R01	N	SW8081	SW3550	alpha bhc	4.1	U	4.1	UJ	0.27	4.1	ug/Kg	SS
SD	NDW06SD16K-R01	N	SW8081	SW3550	alpha bhc	4.2	U	4.2	UJ	0.27	4.2	ug/Kg	SS
SD	NDW06SD07-R01	N	SW8081	SW3550	alpha bhc	5.5	U	5.5	R	0.35	5.5	ug/Kg	SS
WG	NDW06GW05-R01	N	SW8081	SW3510	alpha bhc	0.01	U	0.01	R	0.0012	0.010	ug/L	SS
WS	NDW06SW02-R01	N	SW8081	SW3510	alpha bhc	0.01	U	0.01	UJ	0.0012	0.010	ug/L	SS
SD	NDW06FD03P-R01	FD	SW8081	SW3550	alpha endosulfan	2.3	U	2.3	R	0.094	2.3	ug/Kg	SS

EXHIBIT 4
Change in Qualifier Through the Data Validation Process

Matrix	Sample ID	Sample Type	Analytical Method	Prep Method	Parameter	Lab Result	Lab Qual	Final Result	Final Qual	DL	RL	Units	DV Notes
SS	NDW06SS11-R01	N	SW8081	SW3550	alpha endosulfan	2.2	U	2.2	UJ	0.091	2.2	ug/Kg	SS
SD	NDW06SD14-R01	N	SW8081	SW3550	alpha endosulfan	2.6	U	2.6	R	0.10	2.6	ug/Kg	SS
SD	NDW06SD06-R01	N	SW8081	SW3550	alpha endosulfan	4.1	U	4.1	UJ	0.17	4.1	ug/Kg	SS
SD	NDW06SD16K-R01	N	SW8081	SW3550	alpha endosulfan	4.2	U	4.2	UJ	0.17	4.2	ug/Kg	SS
SD	NDW06SD07-R01	N	SW8081	SW3550	alpha endosulfan	5.5	U	5.5	R	0.22	5.5	ug/Kg	SS
WG	NDW06GW05-R01	N	SW8081	SW3510	alpha endosulfan	0.01	U	0.01	R	0.0043	0.010	ug/L	SS
WS	NDW06SW02-R01	N	SW8081	SW3510	alpha endosulfan	0.01	U	0.01	UJ	0.0044	0.010	ug/L	SS
WG	NDA008	N	SW8081	SW3510	alpha endosulfan	0.01	U	0.01	UJ	0.010	0.010	ug/L	SS
SD	NDW06FD03P-R01	FD	SW8081	SW3550	alpha-chlordane	2.3	U	2.3	R	0.15	2.3	ug/Kg	SS
SS	NDW06SS11-R01	N	SW8081	SW3550	alpha-chlordane	2.2	U	2.2	UJ	0.14	2.2	ug/Kg	SS
SD	NDW06SD14-R01	N	SW8081	SW3550	alpha-chlordane	2.6	U	2.6	R	0.17	2.6	ug/Kg	SS
SD	NDW06SD06-R01	N	SW8081	SW3550	alpha-chlordane	4.1	U	4.1	UJ	0.27	4.1	ug/Kg	SS
SD	NDW06SD16K-R01	N	SW8081	SW3550	alpha-chlordane	4.2	U	4.2	UJ	0.27	4.2	ug/Kg	SS
SD	NDW06SD07-R01	N	SW8081	SW3550	alpha-chlordane	5.5	U	5.5	R	0.35	5.5	ug/Kg	SS
WG	NDW06GW05-R01	N	SW8081	SW3510	alpha-chlordane	0.01	U	0.01	R	0.0022	0.010	ug/L	SS
WS	NDW06SW02-R01	N	SW8081	SW3510	alpha-chlordane	0.01	U	0.01	UJ	0.0022	0.010	ug/L	SS
WG	NDA008	N	SW8081	SW3510	alpha-chlordane	0.01	U	0.01	UJ	0.010	0.010	ug/L	SS
SD	NDW06FD03P-R01	FD	SW8081	SW3550	beta bhc	2.3	U	2.3	R	0.082	2.3	ug/Kg	SS
SS	NDW06SS11-R01	N	SW8081	SW3550	beta bhc	2.2	U	2.2	UJ	0.079	2.2	ug/Kg	SS
SD	NDW06SD14-R01	N	SW8081	SW3550	beta bhc	2.6	U	2.6	R	0.091	2.6	ug/Kg	SS
SD	NDW06SD06-R01	N	SW8081	SW3550	beta bhc	4.1	U	4.1	UJ	0.14	4.1	ug/Kg	SS
SD	NDW06SD16K-R01	N	SW8081	SW3550	beta bhc	4.2	U	4.2	UJ	0.15	4.2	ug/Kg	SS
SD	NDW06SD07-R01	N	SW8081	SW3550	beta bhc	5.5	U	5.5	R	0.19	5.5	ug/Kg	SS
WG	NDW06GW05-R01	N	SW8081	SW3510	beta bhc	0.01	U	0.01	R	0.0018	0.010	ug/L	SS
WS	NDW06SW02-R01	N	SW8081	SW3510	beta bhc	0.01	U	0.01	UJ	0.0018	0.010	ug/L	SS
WG	NDA008	N	SW8081	SW3510	beta bhc	0.01	U	0.01	UJ	0.010	0.010	ug/L	SS
SD	NDW06FD03P-R01	FD	SW8081	SW3550	beta endosulfan	4.5	U	4.5	R	0.064	4.5	ug/Kg	SS
SS	NDW06SS11-R01	N	SW8081	SW3550	beta endosulfan	4.3	U	4.3	UJ	0.062	4.3	ug/Kg	SS
SD	NDW06SD14-R01	N	SW8081	SW3550	beta endosulfan	5	U	5	R	0.071	5.0	ug/Kg	SS
SD	NDW06SD06-R01	N	SW8081	SW3550	beta endosulfan	8	U	8	UJ	0.11	8.0	ug/Kg	SS
SD	NDW06SD16K-R01	N	SW8081	SW3550	beta endosulfan	8.2	U	8.2	UJ	0.12	8.2	ug/Kg	SS
SD	NDW06SD07-R01	N	SW8081	SW3550	beta endosulfan	11	U	11	R	0.15	11.0	ug/Kg	SS
WG	NDW06GW05-R01	N	SW8081	SW3510	beta endosulfan	0.02	U	0.02	R	0.0018	0.020	ug/L	SS
WS	NDW06SW02-R01	N	SW8081	SW3510	beta endosulfan	0.02	U	0.02	UJ	0.0018	0.020	ug/L	SS
WG	NDA008	N	SW8081	SW3510	beta endosulfan	0.02	U	0.02	UJ	0.010	0.020	ug/L	SS
SD	NDW06FD03P-R01	FD	SW8081	SW3550	delta bhc	2.3	U	2.3	R	0.098	2.3	ug/Kg	SS
SS	NDW06SS11-R01	N	SW8081	SW3550	delta bhc	2.2	U	2.2	UJ	0.095	2.2	ug/Kg	SS
SD	NDW06SD14-R01	N	SW8081	SW3550	delta bhc	2.6	U	2.6	R	0.11	2.6	ug/Kg	SS
SD	NDW06SD06-R01	N	SW8081	SW3550	delta bhc	4.1	U	4.1	UJ	0.18	4.1	ug/Kg	SS
SD	NDW06SD16K-R01	N	SW8081	SW3550	delta bhc	4.2	U	4.2	UJ	0.18	4.2	ug/Kg	SS
SD	NDW06SD07-R01	N	SW8081	SW3550	delta bhc	5.5	U	5.5	R	0.23	5.5	ug/Kg	SS
WG	NDW06GW05-R01	N	SW8081	SW3510	delta bhc	0.01	U	0.01	R	0.0058	0.010	ug/L	SS
WS	NDW06SW02-R01	N	SW8081	SW3510	delta bhc	0.01	U	0.01	UJ	0.0059	0.010	ug/L	SS
WG	NDA008	N	SW8081	SW3510	delta bhc	0.01	U	0.01	UJ	0.010	0.010	ug/L	SS
SD	NDW06FD03P-R01	FD	SW8081	SW3550	Dieldrin	4.5	U	4.5	R	0.049	4.5	ug/Kg	SS

EXHIBIT 4
Change in Qualifier Through the Data Validation Process

Matrix	Sample ID	Sample Type	Analytical Method	Prep Method	Parameter	Lab Result	Lab Qual	Final Result	Final Qual	DL	RL	Units	DV Notes
SS	NDW06SS11-R01	N	SW8081	SW3550	Dieldrin	4.3	U	4.3	UJ	0.047	4.3	ug/Kg	SS
SD	NDW06SD14-R01	N	SW8081	SW3550	Dieldrin	5	U	5	R	0.054	5.0	ug/Kg	SS
SD	NDW06SD06-R01	N	SW8081	SW3550	Dieldrin	8	U	8	UJ	0.088	8.0	ug/Kg	SS
SD	NDW06SD16K-R01	N	SW8081	SW3550	Dieldrin	8.2	U	8.2	UJ	0.090	8.2	ug/Kg	SS
SD	NDW06SD07-R01	N	SW8081	SW3550	Dieldrin	11	U	11	R	0.12	11.0	ug/Kg	SS
WG	NDW06GW05-R01	N	SW8081	SW3510	Dieldrin	0.02	U	0.02	R	0.0038	0.020	ug/L	SS
WS	NDW06SW02-R01	N	SW8081	SW3510	Dieldrin	0.02	U	0.02	UJ	0.0039	0.020	ug/L	SS
WG	NDA008	N	SW8081	SW3510	Dieldrin	0.02	U	0.02	UJ	0.020	0.020	ug/L	SS
SD	NDW06FD03P-R01	FD	SW8081	SW3550	endosulfan sulfate	4.5	U	4.5	R	0.34	4.5	ug/Kg	SS
SS	NDW06SS11-R01	N	SW8081	SW3550	endosulfan sulfate	4.3	U	4.3	UJ	0.33	4.3	ug/Kg	SS
SD	NDW06SD14-R01	N	SW8081	SW3550	endosulfan sulfate	5	U	5	R	0.38	5.0	ug/Kg	SS
SD	NDW06SD06-R01	N	SW8081	SW3550	endosulfan sulfate	8	U	8	UJ	0.61	8.0	ug/Kg	SS
SD	NDW06SD16K-R01	N	SW8081	SW3550	endosulfan sulfate	8.2	U	8.2	UJ	0.62	8.2	ug/Kg	SS
SD	NDW06SD07-R01	N	SW8081	SW3550	endosulfan sulfate	11	U	11	R	0.80	11.0	ug/Kg	SS
WG	NDW06GW05-R01	N	SW8081	SW3510	endosulfan sulfate	0.02	U	0.02	R	0.0022	0.020	ug/L	SS
WS	NDW06SW02-R01	N	SW8081	SW3510	endosulfan sulfate	0.02	U	0.02	UJ	0.0022	0.020	ug/L	SS
WG	NDA008	N	SW8081	SW3510	endosulfan sulfate	0.02	U	0.02	UJ	0.010	0.020	ug/L	SS
SD	NDW06FD03P-R01	FD	SW8081	SW3550	endrin	4.5	U	4.5	R	0.12	4.5	ug/Kg	SS
SS	NDW06SS11-R01	N	SW8081	SW3550	endrin	4.3	U	4.3	UJ	0.12	4.3	ug/Kg	SS
SD	NDW06SD14-R01	N	SW8081	SW3550	endrin	5	U	5	R	0.13	5.0	ug/Kg	SS
SD	NDW06SD06-R01	N	SW8081	SW3550	endrin	8	U	8	UJ	0.21	8.0	ug/Kg	SS
SD	NDW06SD16K-R01	N	SW8081	SW3550	endrin	8.2	U	8.2	UJ	0.22	8.2	ug/Kg	SS
SD	NDW06SD07-R01	N	SW8081	SW3550	endrin	11	U	11	R	0.28	11.0	ug/Kg	SS
WG	NDW06GW05-R01	N	SW8081	SW3510	endrin	0.02	U	0.02	R	0.0044	0.020	ug/L	SS
WS	NDW06SW02-R01	N	SW8081	SW3510	endrin	0.02	U	0.02	UJ	0.0045	0.020	ug/L	SS
WG	NDA008	N	SW8081	SW3510	endrin	0.02	U	0.02	UJ	0.010	0.020	ug/L	SS
SD	NDW06FD03P-R01	FD	SW8081	SW3550	endrin aldehyde	4.5	U	4.5	R	0.24	4.5	ug/Kg	SS
SS	NDW06SS11-R01	N	SW8081	SW3550	endrin aldehyde	4.3	U	4.3	UJ	0.24	4.3	ug/Kg	SS
SD	NDW06SD14-R01	N	SW8081	SW3550	endrin aldehyde	5	U	5	R	0.27	5.0	ug/Kg	SS
SD	NDW06SD06-R01	N	SW8081	SW3550	endrin aldehyde	8	U	8	UJ	0.44	8.0	ug/Kg	SS
SD	NDW06SD16K-R01	N	SW8081	SW3550	endrin aldehyde	8.2	U	8.2	UJ	0.45	8.2	ug/Kg	SS
SD	NDW06SD07-R01	N	SW8081	SW3550	endrin aldehyde	11	U	11	R	0.58	11.0	ug/Kg	SS
WG	NDW06GW05-R01	N	SW8081	SW3510	endrin aldehyde	0.02	U	0.02	R	0.0051	0.020	ug/L	SS
WS	NDW06SW02-R01	N	SW8081	SW3510	endrin aldehyde	0.02	U	0.02	UJ	0.0052	0.020	ug/L	SS
WG	NDA008	N	SW8081	SW3510	endrin aldehyde	0.02	U	0.02	UJ	0.010	0.020	ug/L	SS
SD	NDW06FD03P-R01	FD	SW8081	SW3550	endrin ketone	4.5	U	4.5	R	0.26	4.5	ug/Kg	SS
SS	NDW06SS11-R01	N	SW8081	SW3550	endrin ketone	4.3	U	4.3	UJ	0.25	4.3	ug/Kg	SS
SD	NDW06SD14-R01	N	SW8081	SW3550	endrin ketone	5	U	5	R	0.29	5.0	ug/Kg	SS
SD	NDW06SD06-R01	N	SW8081	SW3550	endrin ketone	8	U	8	UJ	0.46	8.0	ug/Kg	SS
SD	NDW06SD16K-R01	N	SW8081	SW3550	endrin ketone	8.2	U	8.2	UJ	0.47	8.2	ug/Kg	SS
SD	NDW06SD07-R01	N	SW8081	SW3550	endrin ketone	11	U	11	R	0.61	11.0	ug/Kg	SS
WG	NDW06GW05-R01	N	SW8081	SW3510	endrin ketone	0.02	U	0.02	R	0.0034	0.020	ug/L	SS
WS	NDW06SW02-R01	N	SW8081	SW3510	endrin ketone	0.02	U	0.02	UJ	0.0035	0.020	ug/L	SS
WG	NDA008	N	SW8081	SW3510	endrin ketone	0.02	U	0.02	UJ	0.010	0.020	ug/L	SS
SD	NDW06FD03P-R01	FD	SW8081	SW3550	gamma bhc (lindane)	2.3	U	2.3	R	0.15	2.3	ug/Kg	SS

EXHIBIT 4
Change in Qualifier Through the Data Validation Process

Matrix	Sample ID	Sample Type	Analytical Method	Prep Method	Parameter	Lab Result	Lab Qual	Final Result	Final Qual	DL	RL	Units	DV Notes
SS	NDW06SS11-R01	N	SW8081	SW3550	gamma bhc (lindane)	2.2	U	2.2	UJ	0.14	2.2	ug/Kg	SS
SD	NDW06SD14-R01	N	SW8081	SW3550	gamma bhc (lindane)	2.6	U	2.6	R	0.17	2.6	ug/Kg	SS
SD	NDW06SD06-R01	N	SW8081	SW3550	gamma bhc (lindane)	4.1	U	4.1	UJ	0.27	4.1	ug/Kg	SS
SD	NDW06SD16K-R01	N	SW8081	SW3550	gamma bhc (lindane)	4.2	U	4.2	UJ	0.27	4.2	ug/Kg	SS
SD	NDW06SD07-R01	N	SW8081	SW3550	gamma bhc (lindane)	5.5	U	5.5	R	0.35	5.5	ug/Kg	SS
WG	NDW06GW05-R01	N	SW8081	SW3510	gamma bhc (lindane)	0.01	U	0.01	R	0.0019	0.010	ug/L	SS
WS	NDW06SW02-R01	N	SW8081	SW3510	gamma bhc (lindane)	0.01	U	0.01	UJ	0.0019	0.010	ug/L	SS
SD	NDW06FD03P-R01	FD	SW8081	SW3550	gamma-chlordane	2.3	U	2.3	R	0.15	2.3	ug/Kg	SS
SS	NDW06SS11-R01	N	SW8081	SW3550	gamma-chlordane	2.2	U	2.2	UJ	0.14	2.2	ug/Kg	SS
SD	NDW06SD14-R01	N	SW8081	SW3550	gamma-chlordane	2.6	U	2.6	R	0.17	2.6	ug/Kg	SS
SD	NDW06SD06-R01	N	SW8081	SW3550	gamma-chlordane	4.1	U	4.1	UJ	0.27	4.1	ug/Kg	SS
SD	NDW06SD16K-R01	N	SW8081	SW3550	gamma-chlordane	4.2	U	4.2	UJ	0.27	4.2	ug/Kg	SS
SD	NDW06SD07-R01	N	SW8081	SW3550	gamma-chlordane	5.5	U	5.5	R	0.35	5.5	ug/Kg	SS
WG	NDW06GW05-R01	N	SW8081	SW3510	gamma-chlordane	0.01	U	0.01	R	0.0025	0.010	ug/L	SS
WS	NDW06SW02-R01	N	SW8081	SW3510	gamma-chlordane	0.01	U	0.01	UJ	0.0026	0.010	ug/L	SS
WG	NDA008	N	SW8081	SW3510	gamma-chlordane	0.01	U	0.01	UJ	0.010	0.010	ug/L	SS
SD	NDW06FD03P-R01	FD	SW8081	SW3550	heptachlor	2.3	U	2.3	R	0.14	2.3	ug/Kg	SS
SS	NDW06SS11-R01	N	SW8081	SW3550	heptachlor	2.2	U	2.2	UJ	0.13	2.2	ug/Kg	SS
SD	NDW06SD14-R01	N	SW8081	SW3550	heptachlor	2.6	U	2.6	R	0.15	2.6	ug/Kg	SS
SD	NDW06SD06-R01	N	SW8081	SW3550	heptachlor	4.1	U	4.1	UJ	0.24	4.1	ug/Kg	SS
SD	NDW06SD16K-R01	N	SW8081	SW3550	heptachlor	4.2	U	4.2	UJ	0.25	4.2	ug/Kg	SS
SD	NDW06SD07-R01	N	SW8081	SW3550	heptachlor	5.5	U	5.5	R	0.32	5.5	ug/Kg	SS
WG	NDW06GW05-R01	N	SW8081	SW3510	heptachlor	0.01	U	0.01	R	0.0022	0.010	ug/L	SS
WS	NDW06SW02-R01	N	SW8081	SW3510	heptachlor	0.01	U	0.01	UJ	0.0022	0.010	ug/L	SS
WG	NDA008	N	SW8081	SW3510	heptachlor	0.01	U	0.01	UJ	0.010	0.010	ug/L	SS
SD	NDW06FD03P-R01	FD	SW8081	SW3550	heptachlor epoxide	2.3	U	2.3	R	0.11	2.3	ug/Kg	SS
SS	NDW06SS11-R01	N	SW8081	SW3550	heptachlor epoxide	2.2	U	2.2	UJ	0.10	2.2	ug/Kg	SS
SD	NDW06SD14-R01	N	SW8081	SW3550	heptachlor epoxide	2.6	U	2.6	R	0.12	2.6	ug/Kg	SS
SD	NDW06SD06-R01	N	SW8081	SW3550	heptachlor epoxide	4.1	U	4.1	UJ	0.19	4.1	ug/Kg	SS
SD	NDW06SD16K-R01	N	SW8081	SW3550	heptachlor epoxide	4.2	U	4.2	UJ	0.19	4.2	ug/Kg	SS
SD	NDW06SD07-R01	N	SW8081	SW3550	heptachlor epoxide	5.5	U	5.5	R	0.25	5.5	ug/Kg	SS
WG	NDW06GW05-R01	N	SW8081	SW3510	heptachlor epoxide	0.01	U	0.01	R	0.0025	0.010	ug/L	SS
WS	NDW06SW02-R01	N	SW8081	SW3510	heptachlor epoxide	0.01	U	0.01	UJ	0.0026	0.010	ug/L	SS
WG	NDA008	N	SW8081	SW3510	heptachlor epoxide	0.01	U	0.01	UJ	0.010	0.010	ug/L	SS
SD	NDW06FD03P-R01	FD	SW8081	SW3550	methoxychlor	23	U	23	R	0.35	23.0	ug/Kg	SS
SS	NDW08SS11-R01	N	SW8081	SW3550	methoxychlor	22	U	22	UJ	0.34	22.0	ug/Kg	SS
SD	NDW06SD14-R01	N	SW8081	SW3550	methoxychlor	26	U	26	R	0.39	26.0	ug/Kg	SS
SD	NDW06SD06-R01	N	SW8081	SW3550	methoxychlor	41	U	41	UJ	0.63	41.0	ug/Kg	SS
SD	NDW06SD16K-R01	N	SW8081	SW3550	methoxychlor	42	U	42	UJ	0.65	42.0	ug/Kg	SS
SD	NDW06SD07-R01	N	SW8081	SW3550	methoxychlor	55	U	55	R	0.84	55.0	ug/Kg	SS
WG	NDW06GW05-R01	N	SW8081	SW3510	methoxychlor	0.1	U	0.1	R	0.0030	0.10	ug/L	SS
WS	NDW06SW02-R01	N	SW8081	SW3510	methoxychlor	0.1	U	0.1	UJ	0.0031	0.10	ug/L	SS
WG	NDA008	N	SW8081	SW3510	methoxychlor	0.11	U	0.11	UJ	0.010	0.11	ug/L	SS
SD	NDW06FD03P-R01	FD	SW8081	SW3550	p,p'-DDD	0.89	J	0.89	J	0.18	4.5	ug/Kg	SS
SS	NDW06SS11-R01	N	SW8081	SW3550	p,p'-DDD	4.3	U	4.3	UJ	0.17	4.3	ug/Kg	SS

EXHIBIT 4
Change in Qualifier Through the Data Validation Process

Matrix	Sample ID	Sample Type	Analytical Method	Prep Method	Parameter	Lab Result	Lab Qual	Final Result	Final Qual	DL	RL	Units	DV Notes
SD	NDW06SD14-R01	N	SW8081	SW3550	p,p'-DDD	0.26	J	0.26	J	0.20	5.0	ug/Kg	SS
SD	NDW06SD06-R01	N	SW8081	SW3550	p,p'-DDD	8	U	8	UJ	0.32	8.0	ug/Kg	SS
SD	NDW06SD16K-R01	N	SW8081	SW3550	p,p'-DDD	8.2	U	8.2	UJ	0.32	8.2	ug/Kg	SS
SD	NDW06SD07-R01	N	SW8081	SW3550	p,p'-DDD	11	U	11	R	0.42	11.0	ug/Kg	SS
WG	NDW06GW05-R01	N	SW8081	SW3510	p,p'-DDD	0.02	U	0.02	R	0.0040	0.020	ug/L	SS
WS	NDW06SW02-R01	N	SW8081	SW3510	p,p'-DDD	0.02	U	0.02	UJ	0.0041	0.020	ug/L	SS
WG	NDA008	N	SW8081	SW3510	p,p'-DDD	0.02	U	0.02	UJ	0.010	0.020	ug/L	SS
SD	NDW06FD03P-R01	FD	SW8081	SW3550	p,p'-DDE	0.35	JP	0.35	R	0.073	4.5	ug/Kg	SS
SS	NDW06SS11-R01	N	SW8081	SW3550	p,p'-DDE	4.3	U	4.3	UJ	0.071	4.3	ug/Kg	SS
SD	NDW06SD14-R01	N	SW8081	SW3550	p,p'-DDE	5	U	5	R	0.082	5.0	ug/Kg	SS
SD	NDW06SD06-R01	N	SW8081	SW3550	p,p'-DDE	8	U	8	UJ	0.13	8.0	ug/Kg	SS
SD	NDW06SD16K-R01	N	SW8081	SW3550	p,p'-DDE	8.2	U	8.2	UJ	0.13	8.2	ug/Kg	SS
SD	NDW06SD07-R01	N	SW8081	SW3550	p,p'-DDE	11	U	11	R	0.17	11.0	ug/Kg	SS
WG	NDW06GW05-R01	N	SW8081	SW3510	p,p'-DDE	0.02	U	0.02	R	0.0056	0.020	ug/L	SS
WS	NDW06SW02-R01	N	SW8081	SW3510	p,p'-DDE	0.02	U	0.02	UJ	0.0057	0.020	ug/L	SS
WG	NDA008	N	SW8081	SW3510	p,p'-DDE	0.02	U	0.02	UJ	0.010	0.020	ug/L	SS
SD	NDW06FD03P-R01	FD	SW8081	SW3550	p,p'-DDT	4.5	U	4.5	R	0.26	4.5	ug/Kg	SS
SS	NDW06SS11-R01	N	SW8081	SW3550	p,p'-DDT	4.3	U	4.3	UJ	0.25	4.3	ug/Kg	SS
SD	NDW06SD14-R01	N	SW8081	SW3550	p,p'-DDT	0.35	J	0.35	J	0.29	5.0	ug/Kg	SS
SD	NDW06SD06-R01	N	SW8081	SW3550	p,p'-DDT	8	U	8	UJ	0.46	8.0	ug/Kg	SS
SD	NDW06SD16K-R01	N	SW8081	SW3550	p,p'-DDT	8.2	U	8.2	UJ	0.47	8.2	ug/Kg	SS
SD	NDW06SD07-R01	N	SW8081	SW3550	p,p'-DDT	11	U	11	R	0.61	11.0	ug/Kg	SS
WG	NDW06GW05-R01	N	SW8081	SW3510	p,p'-DDT	0.02	U	0.02	R	0.0044	0.020	ug/L	SS
WS	NDW06SW02-R01	N	SW8081	SW3510	p,p'-DDT	0.02	U	0.02	UJ	0.0045	0.020	ug/L	SS
WG	NDA008	N	SW8081	SW3510	p,p'-DDT	0.02	U	0.02	UJ	0.010	0.020	ug/L	SS
SD	NDW06FD03P-R01	FD	SW8081	SW3550	toxaphene	230	U	230	R	0.76	230	ug/Kg	SS
SS	NDW06SS11-R01	N	SW8081	SW3550	toxaphene	220	U	220	UJ	0.74	220	ug/Kg	SS
SD	NDW06SD14-R01	N	SW8081	SW3550	toxaphene	260	U	260	R	0.85	260	ug/Kg	SS
SD	NDW06SD06-R01	N	SW8081	SW3550	toxaphene	410	U	410	UJ	1.4	410	ug/Kg	SS
SD	NDW06SD16K-R01	N	SW8081	SW3550	toxaphene	420	U	420	UJ	1.4	420	ug/Kg	SS
SD	NDW06SD07-R01	N	SW8081	SW3550	toxaphene	550	U	550	R	1.8	550	ug/Kg	SS
WG	NDW06GW05-R01	N	SW8081	SW3510	toxaphene	0.05	U	0.05	R	0.031	0.050	ug/L	SS
WS	NDW06SW02-R01	N	SW8081	SW3510	toxaphene	0.051	U	0.051	UJ	0.032	0.051	ug/L	SS
WG	NDA008	N	SW8081	SW3510	toxaphene	1.1	U	1.1	UJ	0.21	1.1	ug/L	SS
SD	NDW06SD07-R01	N	SW8082	SW3550	Aroclor-1016	110	U	110	UJ	3.5	110	ug/Kg	SS
SD	NDW06SD07-R01	N	SW8082	SW3550	Aroclor-1221	220	U	220	UJ	3.2	220	ug/Kg	SS
SD	NDW06SD07-R01	N	SW8082	SW3550	Aroclor-1232	110	U	110	UJ	4.2	110	ug/Kg	SS
SD	NDW06SD07-R01	N	SW8082	SW3550	Aroclor-1242	110	U	110	UJ	2.1	110	ug/Kg	SS
SD	NDW06SD07-R01	N	SW8082	SW3550	Aroclor-1248	110	U	110	UJ	1.4	110	ug/Kg	SS
SD	NDW06SD07-R01	N	SW8082	SW3550	Aroclor-1254	110	U	110	UJ	1.3	110	ug/Kg	SS
SD	NDW06SD07-R01	N	SW8082	SW3550	Aroclor-1260	110	U	110	UJ	1.5	110	ug/Kg	SS
SS	NDA117	N	SW8260B	SW5030	1,1,1-Trichloroethane	10	U	10	UJ	0.30	10.0	ug/Kg	SS
SB	NDA118	N	SW8260B	SW5030	1,1,1-Trichloroethane	12	U	12	UJ	0.37	12.0	ug/Kg	SS
SS	NDA084	N	SW8260B	SW5030	1,1,1-Trichloroethane	13	U	13	UJ	0.40	13.0	ug/Kg	SS
SD	NDA302	N	SW8260B	SW5030	1,1,1-Trichloroethane	26	U	26	UJ	0.79	26.0	ug/Kg	SS

EXHIBIT 4
Change in Qualifier Through the Data Validation Process

Matrix	Sample ID	Sample Type	Analytical Method	Prep Method	Parameter	Lab Result	Lab Qual	Final Result	Final Qual	DL	RL	Units	DV Notes
SD	NDA045	N	SW8260B	SW5030	1,1,1-Trichloroethane	36	U	36	UJ	1.0	36.0	ug/Kg	SS
SD	NDA046	N	SW8260B	SW5030	1,1,1-Trichloroethane	43	U	43	UJ	1.0	43.0	ug/Kg	SS
SD	NDA303	N	SW8260B	SW5030	1,1,1-Trichloroethane	47	U	47	UJ	1.0	47.0	ug/Kg	SS
SS	NDA117	N	SW8260B	SW5030	1,1,2,2-Tetrachloroethane	10	U	10	UJ	0.15	10.0	ug/Kg	SS
SB	NDA118	N	SW8260B	SW5030	1,1,2,2-Tetrachloroethane	12	U	12	UJ	0.18	12.0	ug/Kg	SS
SD	NDA302	N	SW8260B	SW5030	1,1,2,2-Tetrachloroethane	26	U	26	UJ	0.38	26.0	ug/Kg	SS
SD	NDA045	N	SW8260B	SW5030	1,1,2,2-Tetrachloroethane	36	U	36	UJ	0.54	36.0	ug/Kg	SS
SD	NDA046	N	SW8260B	SW5030	1,1,2,2-Tetrachloroethane	43	U	43	UJ	0.65	43.0	ug/Kg	SS
SD	NDA303	N	SW8260B	SW5030	1,1,2,2-Tetrachloroethane	47	U	47	UJ	0.70	47.0	ug/Kg	SS
SS	NDA117	N	SW8260B	SW5030	1,1,2-Trichloroethane	10	U	10	UJ	0.35	10.0	ug/Kg	SS
SB	NDA118	N	SW8260B	SW5030	1,1,2-Trichloroethane	12	U	12	UJ	0.41	12.0	ug/Kg	SS
SS	NDA084	N	SW8260B	SW5030	1,1,2-Trichloroethane	13	U	13	UJ	0.44	13.0	ug/Kg	SS
SD	NDA302	N	SW8260B	SW5030	1,1,2-Trichloroethane	26	U	26	UJ	0.87	26.0	ug/Kg	SS
SD	NDA045	N	SW8260B	SW5030	1,1,2-Trichloroethane	36	U	36	UJ	1.0	36.0	ug/Kg	SS
SD	NDA046	N	SW8260B	SW5030	1,1,2-Trichloroethane	43	U	43	UJ	1.0	43.0	ug/Kg	SS
SD	NDA303	N	SW8260B	SW5030	1,1,2-Trichloroethane	47	U	47	UJ	2.0	47.0	ug/Kg	SS
SS	NDA117	N	SW8260B	SW5030	1,1-Dichloroethane	10	U	10	UJ	0.40	10.0	ug/Kg	SS
SB	NDA118	N	SW8260B	SW5030	1,1-Dichloroethane	12	U	12	UJ	0.47	12.0	ug/Kg	SS
SS	NDA084	N	SW8260B	SW5030	1,1-Dichloroethane	13	U	13	UJ	0.50	13.0	ug/Kg	SS
SD	NDA302	N	SW8260B	SW5030	1,1-Dichloroethane	26	U	26	UJ	1.0	26.0	ug/Kg	SS
SD	NDA045	N	SW8260B	SW5030	1,1-Dichloroethane	36	U	36	UJ	1.0	36.0	ug/Kg	SS
SD	NDA046	N	SW8260B	SW5030	1,1-Dichloroethane	43	U	43	UJ	2.0	43.0	ug/Kg	SS
SD	NDA303	N	SW8260B	SW5030	1,1-Dichloroethane	47	U	47	UJ	2.0	47.0	ug/Kg	SS
SS	NDA117	N	SW8260B	SW5030	1,1-Dichloroethene	10	U	10	UJ	0.40	10.0	ug/Kg	SS
SB	NDA118	N	SW8260B	SW5030	1,1-Dichloroethene	12	U	12	UJ	0.47	12.0	ug/Kg	SS
SS	NDA084	N	SW8260B	SW5030	1,1-Dichloroethene	13	U	13	UJ	0.50	13.0	ug/Kg	SS
SD	NDA302	N	SW8260B	SW5030	1,1-Dichloroethene	26	U	26	UJ	1.0	26.0	ug/Kg	SS
SD	NDA045	N	SW8260B	SW5030	1,1-Dichloroethene	36	U	36	UJ	1.0	36.0	ug/Kg	SS
SD	NDA046	N	SW8260B	SW5030	1,1-Dichloroethene	43	U	43	UJ	2.0	43.0	ug/Kg	SS
SD	NDA303	N	SW8260B	SW5030	1,1-Dichloroethene	47	U	47	UJ	2.0	47.0	ug/Kg	SS
SS	NDA117	N	SW8260B	SW5030	1,2-Dichloroethane	10	U	10	UJ	0.24	10.0	ug/Kg	SS
SB	NDA118	N	SW8260B	SW5030	1,2-Dichloroethane	12	U	12	UJ	0.29	12.0	ug/Kg	SS
SS	NDA084	N	SW8260B	SW5030	1,2-Dichloroethane	13	U	13	UJ	0.31	13.0	ug/Kg	SS
SD	NDA302	N	SW8260B	SW5030	1,2-Dichloroethane	26	U	26	UJ	0.61	26.0	ug/Kg	SS
SD	NDA045	N	SW8260B	SW5030	1,2-Dichloroethane	36	U	36	UJ	0.86	36.0	ug/Kg	SS
SD	NDA046	N	SW8260B	SW5030	1,2-Dichloroethane	43	U	43	UJ	1.0	43.0	ug/Kg	SS
SD	NDA303	N	SW8260B	SW5030	1,2-Dichloroethane	47	U	47	UJ	1.0	47.0	ug/Kg	SS
SS	NDA117	N	SW8260B	SW5030	1,2-Dichloropropane	10	U	10	UJ	0.14	10.0	ug/Kg	SS
SB	NDA118	N	SW8260B	SW5030	1,2-Dichloropropane	12	U	12	UJ	0.16	12.0	ug/Kg	SS
SS	NDA084	N	SW8260B	SW5030	1,2-Dichloropropane	13	U	13	UJ	0.18	13.0	ug/Kg	SS
SD	NDA302	N	SW8260B	SW5030	1,2-Dichloropropane	26	U	26	UJ	0.40	26.0	ug/Kg	SS
SD	NDA045	N	SW8260B	SW5030	1,2-Dichloropropane	36	U	36	UJ	0.50	36.0	ug/Kg	SS
SD	NDA046	N	SW8260B	SW5030	1,2-Dichloropropane	43	U	43	UJ	0.60	43.0	ug/Kg	SS
SD	NDA303	N	SW8260B	SW5030	1,2-Dichloropropane	47	U	47	UJ	0.65	47.0	ug/Kg	SS
SS	NDA117	N	SW8260B	SW5030	2-Hexanone	10	U	10	UJ	1.0	10.0	ug/Kg	SS

EXHIBIT 4
Change in Qualifier Through the Data Validation Process

Matrix	Sample ID	Sample Type	Analytical Method	Prep Method	Parameter	Lab Result	Lab Qual	Final Result	Final Qual	DL	RL	Units	DV Notes
SB	NDA118	N	SW8260B	SW5030	2-Hexanone	12	U	12	UJ	1.0	12.0	ug/Kg	SS
SS	NDA084	N	SW8260B	SW5030	2-Hexanone	13	U	13	UJ	1.0	13.0	ug/Kg	SS
SD	NDA302	N	SW8260B	SW5030	2-Hexanone	26	U	26	UJ	3.0	26.0	ug/Kg	SS
SD	NDA045	N	SW8260B	SW5030	2-Hexanone	36	U	36	UJ	4.0	36.0	ug/Kg	SS
SD	NDA046	N	SW8260B	SW5030	2-Hexanone	43	U	43	UJ	5.0	43.0	ug/Kg	SS
SD	NDA303	N	SW8260B	SW5030	2-Hexanone	47	U	47	UJ	5.0	47.0	ug/Kg	SS
SS	NDA117	N	SW8260B	SW5030	4-methyl-2-pentanone (MIBK)	10	U	10	UJ	1.0	10.0	ug/Kg	SS
SB	NDA118	N	SW8260B	SW5030	4-methyl-2-pentanone (MIBK)	12	U	12	UJ	2.0	12.0	ug/Kg	SS
SS	NDA084	N	SW8260B	SW5030	4-methyl-2-pentanone (MIBK)	13	U	13	UJ	2.0	13.0	ug/Kg	SS
SD	NDA302	N	SW8260B	SW5030	4-methyl-2-pentanone (MIBK)	26	U	26	UJ	3.0	26.0	ug/Kg	SS
SD	NDA045	N	SW8260B	SW5030	4-methyl-2-pentanone (MIBK)	36	U	36	UJ	5.0	36.0	ug/Kg	SS
SD	NDA046	N	SW8260B	SW5030	4-methyl-2-pentanone (MIBK)	43	U	43	UJ	6.0	43.0	ug/Kg	SS
SD	NDA303	N	SW8260B	SW5030	4-methyl-2-pentanone (MIBK)	47	U	47	UJ	6.0	47.0	ug/Kg	SS
SS	NDA117	N	SW8260B	SW5030	Benzene	10	U	10	UJ	0.11	10.0	ug/Kg	SS
SB	NDA118	N	SW8260B	SW5030	Benzene	12	U	12	UJ	0.13	12.0	ug/Kg	SS
SS	NDA084	N	SW8260B	SW5030	Benzene	13	U	13	UJ	0.14	13.0	ug/Kg	SS
SB	NDA105	N	SW8260B	SW5030	Benzene	0.2	J	0.2	J	0.18	17.0	ug/Kg	SS
SD	NDA302	N	SW8260B	SW5030	Benzene	26	U	26	UJ	0.28	26.0	ug/Kg	SS
SD	NDA045	N	SW8260B	SW5030	Benzene	36	U	36	UJ	0.39	36.0	ug/Kg	SS
SD	NDA046	N	SW8260B	SW5030	Benzene	43	U	43	UJ	0.50	43.0	ug/Kg	SS
SD	NDA303	N	SW8260B	SW5030	Benzene	47	U	47	UJ	0.50	47.0	ug/Kg	SS
SS	NDA117	N	SW8260B	SW5030	Bromodichloromethane	10	U	10	UJ	0.20	10.0	ug/Kg	SS
SB	NDA118	N	SW8260B	SW5030	Bromodichloromethane	12	U	12	UJ	0.24	12.0	ug/Kg	SS
SS	NDA084	N	SW8260B	SW5030	Bromodichloromethane	13	U	13	UJ	0.25	13.0	ug/Kg	SS
SD	NDA302	N	SW8260B	SW5030	Bromodichloromethane	26	U	26	UJ	0.51	26.0	ug/Kg	SS
SD	NDA045	N	SW8260B	SW5030	Bromodichloromethane	36	U	36	UJ	0.72	36.0	ug/Kg	SS
SD	NDA046	N	SW8260B	SW5030	Bromodichloromethane	43	U	43	UJ	0.90	43.0	ug/Kg	SS
SD	NDA303	N	SW8260B	SW5030	Bromodichloromethane	47	U	47	UJ	0.94	47.0	ug/Kg	SS
SS	NDA117	N	SW8260B	SW5030	Bromoform	10	U	10	UJ	0.30	10.0	ug/Kg	SS
SB	NDA118	N	SW8260B	SW5030	Bromoform	12	U	12	UJ	0.30	12.0	ug/Kg	SS
SS	NDA084	N	SW8260B	SW5030	Bromoform	13	U	13	UJ	0.32	13.0	ug/Kg	SS
SD	NDA302	N	SW8260B	SW5030	Bromoform	26	U	26	UJ	0.60	26.0	ug/Kg	SS
SD	NDA045	N	SW8260B	SW5030	Bromoform	36	U	36	UJ	0.90	36.0	ug/Kg	SS
SD	NDA046	N	SW8260B	SW5030	Bromoform	43	U	43	UJ	1.0	43.0	ug/Kg	SS
SD	NDA303	N	SW8260B	SW5030	Bromoform	47	U	47	UJ	1.0	47.0	ug/Kg	SS
SS	NDA117	N	SW8260B	SW5030	Bromomethane	10	U	10	UJ	0.46	10.0	ug/Kg	SS
SB	NDA118	N	SW8260B	SW5030	Bromomethane	12	U	12	UJ	0.54	12.0	ug/Kg	SS
SS	NDA084	N	SW8260B	SW5030	Bromomethane	13	U	13	UJ	0.58	13.0	ug/Kg	SS
SD	NDA302	N	SW8260B	SW5030	Bromomethane	26	U	26	UJ	1.0	26.0	ug/Kg	SS
SD	NDA045	N	SW8260B	SW5030	Bromomethane	36	U	36	UJ	2.0	36.0	ug/Kg	SS
SD	NDA046	N	SW8260B	SW5030	Bromomethane	43	U	43	UJ	2.0	43.0	ug/Kg	SS
SD	NDA303	N	SW8260B	SW5030	Bromomethane	47	U	47	UJ	2.0	47.0	ug/Kg	SS
SB	NDA106FD1	FD	SW8260B	SW5030	Carbon disulfide	2	J	2	J	0.50	16.0	ug/Kg	SS
SS	NDA117	N	SW8260B	SW5030	Carbon disulfide	10	U	10	UJ	0.30	10.0	ug/Kg	SS
SB	NDA118	N	SW8260B	SW5030	Carbon disulfide	6	J	6	J	0.37	12.0	ug/Kg	SS

EXHIBIT 4
Change in Qualifier Through the Data Validation Process

Matrix	Sample ID	Sample Type	Analytical Method	Prep Method	Parameter	Lab Result	Lab Qual	Final Result	Final Qual	DL	RL	Units	DV Notes
SS	NDA084	N	SW8260B	SW5030	Carbon disulfide	13	U	13	UJ	0.40	13.0	ug/Kg	SS
SB	NDA105	N	SW8260B	SW5030	Carbon disulfide	4	J	4	J	0.52	17.0	ug/Kg	SS
SS	NDW06SS15-R01	N	SW8260B	SW5030	Carbon disulfide	1.3	J	1.3	J	1.0	19.8	ug/Kg	SS
SD	NDA302	N	SW8260B	SW5030	Carbon disulfide	8	J	8	J	0.79	26.0	ug/Kg	SS
SD	NDA045	N	SW8260B	SW5030	Carbon disulfide	13	J	13	J	1.0	36.0	ug/Kg	SS
SD	NDA046	N	SW8260B	SW5030	Carbon disulfide	15	J	15	J	1.0	43.0	ug/Kg	SS
SD	NDA303	N	SW8260B	SW5030	Carbon disulfide	20	J	20	J	1.0	47.0	ug/Kg	SS
SD	NDW06SD05-R01	N	SW8260B	SW5030	Carbon disulfide	4.8	J	4.8	J	2.7	52.6	ug/Kg	SS
SS	NDA117	N	SW8260B	SW5030	Carbon tetrachloride	10	U	10	UJ	0.40	10.0	ug/Kg	SS
SB	NDA118	N	SW8260B	SW5030	Carbon tetrachloride	12	U	12	UJ	0.50	12.0	ug/Kg	SS
SS	NDA084	N	SW8260B	SW5030	Carbon tetrachloride	13	U	13	UJ	0.50	13.0	ug/Kg	SS
SD	NDA302	N	SW8260B	SW5030	Carbon tetrachloride	26	U	26	UJ	0.97	26.0	ug/Kg	SS
SD	NDA045	N	SW8260B	SW5030	Carbon tetrachloride	36	U	36	UJ	1.0	36.0	ug/Kg	SS
SD	NDA046	N	SW8260B	SW5030	Carbon tetrachloride	43	U	43	UJ	2.0	43.0	ug/Kg	SS
SD	NDA303	N	SW8260B	SW5030	Carbon tetrachloride	47	U	47	UJ	2.0	47.0	ug/Kg	SS
SS	NDA117	N	SW8260B	SW5030	Chlorobenzene	10	U	10	UJ	0.20	10.0	ug/Kg	SS
SB	NDA118	N	SW8260B	SW5030	Chlorobenzene	12	U	12	UJ	0.24	12.0	ug/Kg	SS
SS	NDA084	N	SW8260B	SW5030	Chlorobenzene	13	U	13	UJ	0.25	13.0	ug/Kg	SS
SD	NDA302	N	SW8260B	SW5030	Chlorobenzene	26	U	26	UJ	0.51	26.0	ug/Kg	SS
SD	NDA045	N	SW8260B	SW5030	Chlorobenzene	36	U	36	UJ	0.72	36.0	ug/Kg	SS
SD	NDA046	N	SW8260B	SW5030	Chlorobenzene	43	U	43	UJ	0.90	43.0	ug/Kg	SS
SD	NDA303	N	SW8260B	SW5030	Chlorobenzene	47	U	47	UJ	0.94	47.0	ug/Kg	SS
SS	NDA117	N	SW8260B	SW5030	Chloroethane	10	U	10	UJ	0.60	10.0	ug/Kg	SS
SB	NDA118	N	SW8260B	SW5030	Chloroethane	12	U	12	UJ	0.70	12.0	ug/Kg	SS
SS	NDA084	N	SW8260B	SW5030	Chloroethane	13	U	13	UJ	0.70	13.0	ug/Kg	SS
SD	NDA302	N	SW8260B	SW5030	Chloroethane	26	U	26	UJ	1.0	26.0	ug/Kg	SS
SD	NDA045	N	SW8260B	SW5030	Chloroethane	36	U	36	UJ	2.0	36.0	ug/Kg	SS
SD	NDA046	N	SW8260B	SW5030	Chloroethane	43	U	43	UJ	2.0	43.0	ug/Kg	SS
SD	NDA303	N	SW8260B	SW5030	Chloroethane	47	U	47	UJ	3.0	47.0	ug/Kg	SS
SS	NDA117	N	SW8260B	SW5030	Chloroform	10	U	10	UJ	1.0	10.0	ug/Kg	SS
SB	NDA118	N	SW8260B	SW5030	Chloroform	12	U	12	UJ	1.0	12.0	ug/Kg	SS
SS	NDA084	N	SW8260B	SW5030	Chloroform	13	U	13	UJ	1.0	13.0	ug/Kg	SS
SD	NDA302	N	SW8260B	SW5030	Chloroform	26	U	26	UJ	3.0	26.0	ug/Kg	SS
SD	NDA045	N	SW8260B	SW5030	Chloroform	36	U	36	UJ	4.0	36.0	ug/Kg	SS
SD	NDA046	N	SW8260B	SW5030	Chloroform	43	U	43	UJ	4.0	43.0	ug/Kg	SS
SD	NDA303	N	SW8260B	SW5030	Chloroform	47	U	47	UJ	5.0	47.0	ug/Kg	SS
SS	NDA117	N	SW8260B	SW5030	Chloromethane	10	U	10	UJ	0.81	10.0	ug/Kg	SS
SB	NDA118	N	SW8260B	SW5030	Chloromethane	12	U	12	UJ	1.0	12.0	ug/Kg	SS
SS	NDA084	N	SW8260B	SW5030	Chloromethane	13	U	13	UJ	1.0	13.0	ug/Kg	SS
SD	NDA302	N	SW8260B	SW5030	Chloromethane	26	U	26	UJ	2.0	26.0	ug/Kg	SS
SD	NDA045	N	SW8260B	SW5030	Chloromethane	36	U	36	UJ	3.0	36.0	ug/Kg	SS
SD	NDA046	N	SW8260B	SW5030	Chloromethane	43	U	43	UJ	3.0	43.0	ug/Kg	SS
SD	NDA303	N	SW8260B	SW5030	Chloromethane	47	U	47	UJ	4.0	47.0	ug/Kg	SS
SS	NDA117	N	SW8260B	SW5030	cis-1,3-Dichloropropene	10	U	10	UJ	0.28	10.0	ug/Kg	SS
SB	NDA118	N	SW8260B	SW5030	cis-1,3-Dichloropropene	12	U	12	UJ	0.33	12.0	ug/Kg	SS

EXHIBIT 4
Change in Qualifier Through the Data Validation Process

Matrix	Sample ID	Sample Type	Analytical Method	Prep Method	Parameter	Lab Result	Lab Qual	Final Result	Final Qual	DL	RL	Units	DV Notes
SS	NDA084	N	SW8260B	SW5030	cis-1,3-Dichloropropene	13	U	13	UJ	0.36	13.0	ug/Kg	SS
SD	NDA302	N	SW8260B	SW5030	cis-1,3-Dichloropropene	26	U	26	UJ	0.71	26.0	ug/Kg	SS
SD	NDA045	N	SW8260B	SW5030	cis-1,3-Dichloropropene	36	U	36	UJ	1.0	36.0	ug/Kg	SS
SD	NDA046	N	SW8260B	SW5030	cis-1,3-Dichloropropene	43	U	43	UJ	1.0	43.0	ug/Kg	SS
SD	NDA303	N	SW8260B	SW5030	cis-1,3-Dichloropropene	47	U	47	UJ	1.0	47.0	ug/Kg	SS
SS	NDA117	N	SW8260B	SW5030	Dibromochloromethane	10	U	10	UJ	0.20	10.0	ug/Kg	SS
SB	NDA118	N	SW8260B	SW5030	Dibromochloromethane	12	U	12	UJ	0.26	12.0	ug/Kg	SS
SS	NDA084	N	SW8260B	SW5030	Dibromochloromethane	13	U	13	UJ	0.30	13.0	ug/Kg	SS
SD	NDA302	N	SW8260B	SW5030	Dibromochloromethane	26	U	26	UJ	0.56	26.0	ug/Kg	SS
SD	NDA045	N	SW8260B	SW5030	Dibromochloromethane	36	U	36	UJ	0.79	36.0	ug/Kg	SS
SD	NDA046	N	SW8260B	SW5030	Dibromochloromethane	43	U	43	UJ	0.95	43.0	ug/Kg	SS
SD	NDA303	N	SW8260B	SW5030	Dibromochloromethane	47	U	47	UJ	1.0	47.0	ug/Kg	SS
SS	NDA117	N	SW8260B	SW5030	Ethylbenzene	1	J	1	J	0.28	10.0	ug/Kg	SS
SB	NDA118	N	SW8260B	SW5030	Ethylbenzene	12	U	12	UJ	0.33	12.0	ug/Kg	SS
SS	NDA084	N	SW8260B	SW5030	Ethylbenzene	13	U	13	UJ	0.36	13.0	ug/Kg	SS
SB	NDA105	N	SW8260B	SW5030	Ethylbenzene	1	J	1	J	0.47	17.0	ug/Kg	SS
SD	NDA302	N	SW8260B	SW5030	Ethylbenzene	26	U	26	UJ	0.71	26.0	ug/Kg	SS
SD	NDA045	N	SW8260B	SW5030	Ethylbenzene	1	U	1	J	1.0	36.0	ug/Kg	SS
SD	NDA046	N	SW8260B	SW5030	Ethylbenzene	2	J	2	J	1.0	43.0	ug/Kg	SS
SD	NDA303	N	SW8260B	SW5030	Ethylbenzene	1	U	1	J	1.0	47.0	ug/Kg	SS
SS	NDA117	N	SW8260B	SW5030	m,p-Xylene (sum of isomers)	4	J	4	J	0.20	10.0	ug/Kg	SS
SB	NDA118	N	SW8260B	SW5030	m,p-Xylene (sum of isomers)	12	U	12	UJ	0.26	12.0	ug/Kg	SS
SS	NDA084	N	SW8260B	SW5030	m,p-Xylene (sum of isomers)	13	U	13	UJ	0.30	13.0	ug/Kg	SS
SD	NDA302	N	SW8260B	SW5030	m,p-Xylene (sum of isomers)	26	U	26	UJ	0.56	26.0	ug/Kg	SS
SD	NDA045	N	SW8260B	SW5030	m,p-Xylene (sum of isomers)	8	J	8	J	0.79	36.0	ug/Kg	SS
SD	NDA046	N	SW8260B	SW5030	m,p-Xylene (sum of isomers)	10	J	10	J	0.95	43.0	ug/Kg	SS
SD	NDA303	N	SW8280B	SW5030	m,p-Xylene (sum of isomers)	5	J	5	J	1.0	47.0	ug/Kg	SS
SS	NDA117	N	SW8260B	SW5030	Methylene chloride	10	U	10	UJ	2.0	10.0	ug/Kg	SS
SB	NDA118	N	SW8260B	SW5030	Methylene chloride	12	U	12	UJ	2.0	12.0	ug/Kg	SS
SS	NDA084	N	SW8260B	SW5030	Methylene chloride	13	U	13	UJ	3.0	13.0	ug/Kg	SS
SD	NDA302	N	SW8260B	SW5030	Methylene chloride	26	U	26	UJ	5.0	26.0	ug/Kg	SS
SD	NDA045	N	SW8260B	SW5030	Methylene chloride	36	U	36	UJ	7.0	36.0	ug/Kg	SS
SD	NDA046	N	SW8260B	SW5030	Methylene chloride	43	U	43	UJ	9.0	43.0	ug/Kg	SS
SD	NDA303	N	SW8260B	SW5030	Methylene chloride	47	U	47	UJ	9.0	47.0	ug/Kg	SS
SD	NDW06SD05-R01	N	SW8260B	SW5030	Methylene chloride	2.8	J	2.8	J	2.6	52.6	ug/Kg	SS
SS	NDA117	N	SW8260B	SW5030	o-Xylene (1,2-Dimethylbenzene)	2	J	2	J	0.20	10.0	ug/Kg	SS
SB	NDA118	N	SW8260B	SW5030	o-Xylene (1,2-Dimethylbenzene)	12	U	12	UJ	0.26	12.0	ug/Kg	SS
SS	NDA084	N	SW8260B	SW5030	o-Xylene (1,2-Dimethylbenzene)	13	U	13	UJ	0.30	13.0	ug/Kg	SS
SB	NDA105	N	SW8260B	SW5030	o-Xylene (1,2-Dimethylbenzene)	2	J	2	J	0.37	17.0	ug/Kg	SS
SD	NDA302	N	SW8260B	SW5030	o-Xylene (1,2-Dimethylbenzene)	26	U	26	UJ	0.56	26.0	ug/Kg	SS
SD	NDA045	N	SW8260B	SW5030	o-Xylene (1,2-Dimethylbenzene)	2	J	2	J	0.79	36.0	ug/Kg	SS
SD	NDA046	N	SW8260B	SW5030	o-Xylene (1,2-Dimethylbenzene)	3	J	3	J	0.95	43.0	ug/Kg	SS
SD	NDA303	N	SW8260B	SW5030	o-Xylene (1,2-Dimethylbenzene)	2	J	2	J	1.0	47.0	ug/Kg	SS
SS	NDA117	N	SW8260B	SW5030	Styrene	10	U	10	UJ	0.20	10.0	ug/Kg	SS
SB	NDA118	N	SW8260B	SW5030	Styrene	12	U	12	UJ	0.24	12.0	ug/Kg	SS

EXHIBIT 4
Change in Qualifier Through the Data Validation Process

Matrix	Sample ID	Sample Type	Analytical Method	Prep Method	Parameter	Lab Result	Lab Qual	Final Result	Final Qual	DL	RL	Units	DV Notes
SS	NDA084	N	SW8260B	SW5030	Styrene	13	U	13	UJ	0.25	13.0	ug/Kg	SS
SD	NDA302	N	SW8260B	SW5030	Styrene	26	U	26	UJ	0.51	26.0	ug/Kg	SS
SD	NDA045	N	SW8260B	SW5030	Styrene	36	U	36	UJ	0.72	36.0	ug/Kg	SS
SD	NDA046	N	SW8260B	SW5030	Styrene	43	U	43	UJ	0.90	43.0	ug/Kg	SS
SD	NDA303	N	SW8260B	SW5030	Styrene	47	U	47	UJ	0.94	47.0	ug/Kg	SS
SS	NDA117	N	SW8260B	SW5030	Tetrachloroethene (PCE)	10	U	10	UJ	0.54	10.0	ug/Kg	SS
SB	NDA118	N	SW8260B	SW5030	Tetrachloroethene (PCE)	12	U	12	UJ	0.64	12.0	ug/Kg	SS
SS	NDA084	N	SW8260B	SW5030	Tetrachloroethene (PCE)	13	U	13	UJ	0.68	13.0	ug/Kg	SS
SB	NDA105	N	SW8260B	SW5030	Tetrachloroethene (PCE)	2	J	2	J	0.90	17.0	ug/Kg	SS
SD	NDA302	N	SW8260B	SW5030	Tetrachloroethene (PCE)	26	U	26	UJ	1.0	26.0	ug/Kg	SS
SD	NDA045	N	SW8260B	SW5030	Tetrachloroethene (PCE)	36	U	36	UJ	2.0	36.0	ug/Kg	SS
SD	NDA046	N	SW8260B	SW5030	Tetrachloroethene (PCE)	43	U	43	UJ	2.0	43.0	ug/Kg	SS
SD	NDA303	N	SW8260B	SW5030	Tetrachloroethene (PCE)	47	U	47	UJ	2.0	47.0	ug/Kg	SS
SS	NDA117	N	SW8260B	SW5030	Toluene	0.8	J	0.8	J	0.28	10.0	ug/Kg	SS
SB	NDA118	N	SW8260B	SW5030	Toluene	12	U	12	UJ	0.33	12.0	ug/Kg	SS
SS	NDA084	N	SW8260B	SW5030	Toluene	0.4	J	0.4	J	0.36	13.0	ug/Kg	SS
SB	NDA105	N	SW8260B	SW5030	Toluene	0.9	J	0.9	J	0.47	17.0	ug/Kg	SS
SD	NDA302	N	SW8260B	SW5030	Toluene	26	U	26	UJ	0.71	26.0	ug/Kg	SS
SD	NDA045	N	SW8260B	SW5030	Toluene	3	J	3	J	1.0	36.0	ug/Kg	SS
SD	NDA046	N	SW8260B	SW5030	Toluene	3	J	3	J	1.0	43.0	ug/Kg	SS
SD	NDA303	N	SW8260B	SW5030	Toluene	3	J	3	J	1.0	47.0	ug/Kg	SS
SS	NDA117	N	SW8260B	SW5030	trans-1,3-Dichloropropene	10	U	10	UJ	0.27	10.0	ug/Kg	SS
SB	NDA118	N	SW8260B	SW5030	trans-1,3-Dichloropropene	12	U	12	UJ	0.32	12.0	ug/Kg	SS
SS	NDA084	N	SW8260B	SW5030	trans-1,3-Dichloropropene	13	U	13	UJ	0.35	13.0	ug/Kg	SS
SD	NDA302	N	SW8260B	SW5030	trans-1,3-Dichloropropene	26	U	26	UJ	0.70	26.0	ug/Kg	SS
SD	NDA045	N	SW8260B	SW5030	trans-1,3-Dichloropropene	36	U	36	UJ	0.97	36.0	ug/Kg	SS
SD	NDA046	N	SW8260B	SW5030	trans-1,3-Dichloropropene	43	U	43	UJ	1.0	43.0	ug/Kg	SS
SD	NDA303	N	SW8260B	SW5030	trans-1,3-Dichloropropene	47	U	47	UJ	1.0	47.0	ug/Kg	SS
SS	NDA117	N	SW8260B	SW5030	Trichloroethene (TCE)	10	U	10	UJ	0.30	10.0	ug/Kg	SS
SB	NDA118	N	SW8260B	SW5030	Trichloroethene (TCE)	12	U	12	UJ	0.31	12.0	ug/Kg	SS
SS	NDA084	N	SW8280B	SW5030	Trichloroethene (TCE)	13	U	13	UJ	0.30	13.0	ug/Kg	SS
SD	NDA302	N	SW8260B	SW5030	Trichloroethene (TCE)	26	U	26	UJ	0.70	26.0	ug/Kg	SS
SD	NDA045	N	SW8260B	SW5030	Trichloroethene (TCE)	36	U	36	UJ	0.90	36.0	ug/Kg	SS
SD	NDA046	N	SW8260B	SW5030	Trichloroethene (TCE)	43	U	43	UJ	1.0	43.0	ug/Kg	SS
SD	NDA303	N	SW8260B	SW5030	Trichloroethene (TCE)	47	U	47	UJ	1.0	47.0	ug/Kg	SS
SS	NDA117	N	SW8260B	SW5030	Vinyl chloride	10	U	10	UJ	0.50	10.0	ug/Kg	SS
SB	NDA118	N	SW8260B	SW5030	Vinyl chloride	12	U	12	UJ	0.58	12.0	ug/Kg	SS
SS	NDA084	N	SW8260B	SW5030	Vinyl chloride	13	U	13	UJ	0.62	13.0	ug/Kg	SS
SD	NDA302	N	SW8260B	SW5030	Vinyl chloride	26	U	26	UJ	1.0	26.0	ug/Kg	SS
SD	NDA045	N	SW8260B	SW5030	Vinyl chloride	36	U	36	UJ	2.0	36.0	ug/Kg	SS
SD	NDA046	N	SW8260B	SW5030	Vinyl chloride	43	U	43	UJ	2.0	43.0	ug/Kg	SS
SD	NDA303	N	SW8260B	SW5030	Vinyl chloride	47	U	47	UJ	2.0	47.0	ug/Kg	SS
SS	NDA117	N	SW8260B	SW5030	Xylenes, total	6	J	6	J	0.20	10.0	ug/Kg	SS
SB	NDA118	N	SW8260B	SW5030	Xylenes, total	12	U	12	UJ	0.26	12.0	ug/Kg	SS
SS	NDA084	N	SW8260B	SW5030	Xylenes, total	13	U	13	UJ	0.30	13.0	ug/Kg	SS

EXHIBIT 4
Change in Qualifier Through the Data Validation Process

Matrix	Sample ID	Sample Type	Analytical Method	Prep Method	Parameter	Lab Result	Lab Qual	Final Result	Final Qual	DL	RL	Units	DV Notes
SD	NDA302	N	SW8260B	SW5030	Xylenes, total	26	U	26	UJ	0.56	26.0	ug/Kg	SS
SD	NDA045	N	SW8260B	SW5030	Xylenes, total	10	J	10	J	0.79	36.0	ug/Kg	SS
SD	NDA046	N	SW8260B	SW5030	Xylenes, total	13	J	13	J	0.95	43.0	ug/Kg	SS
SD	NDA303	N	SW8260B	SW5030	Xylenes, total	7	J	7	J	1.0	47.0	ug/Kg	SS
SS	NDA104FD1	FD	SW8330	METHOD	1,3,5-trinitrobenzene	355	U	355	R	28.0	355	ug/Kg	SS
WG	NDA0321FD1	FD	SW8330	METHOD	1,3,5-trinitrobenzene	5	U	5	UJ	0.74	5.0	ug/L	SS
WG	NDW06GW01-R01	N	SW8330	METHOD	1,3,5-trinitrobenzene	2.5	U	2.5	UJ	0.055	2.5	ug/L	SS
WG	NDW06GW02-R01	N	SW8330	METHOD	1,3,5-trinitrobenzene	2.5	U	2.5	UJ	0.055	2.5	ug/L	SS
WG	NDW06GW03-R01	N	SW8330	METHOD	1,3,5-trinitrobenzene	2.5	U	2.5	UJ	0.055	2.5	ug/L	SS
WG	NDW06GW05-R01	N	SW8330	METHOD	1,3,5-trinitrobenzene	2.5	U	2.5	UJ	0.055	2.5	ug/L	SS
WG	NDW06GW06-R01	N	SW8330	METHOD	1,3,5-trinitrobenzene	2.5	U	2.5	UJ	0.055	2.5	ug/L	SS
WG	NDW06GW04-R01	N	SW8330	METHOD	1,3,5-trinitrobenzene	2.5	U	2.5	UJ	0.055	2.5	ug/L	SS
WG	NDW06GW07-R01	N	SW8330	METHOD	1,3,5-trinitrobenzene	2.5	U	2.5	UJ	0.055	2.5	ug/L	SS
WG	NDW06GW08-R01	N	SW8330	METHOD	1,3,5-trinitrobenzene	2.5	U	2.5	UJ	0.055	2.5	ug/L	SS
WG	NDA005	N	SW8330	METHOD	1,3,5-trinitrobenzene	5	U	5	UJ	0.74	5.0	ug/L	SS
WG	NDA006	N	SW8330	METHOD	1,3,5-trinitrobenzene	5	U	5	UJ	0.74	5.0	ug/L	SS
WG	NDA008	N	SW8330	METHOD	1,3,5-trinitrobenzene	5	U	5	UJ	0.74	5.0	ug/L	SS
WG	NDA009	N	SW8330	METHOD	1,3,5-trinitrobenzene	5	U	5	UJ	0.74	5.0	ug/L	SS
WG	NDA012	N	SW8330	METHOD	1,3,5-trinitrobenzene	5	U	5	UJ	0.74	5.0	ug/L	SS
WS	NDA037	N	SW8330	METHOD	1,3,5-trinitrobenzene	5	U	5	UJ	0.74	5.0	ug/L	SS
WS	NDA039	N	SW8330	METHOD	1,3,5-trinitrobenzene	5	U	5	UJ	0.74	5.0	ug/L	SS
WS	NDA300	N	SW8330	METHOD	1,3,5-trinitrobenzene	5	U	5	UJ	0.74	5.0	ug/L	SS
SS	NDA104FD1	FD	SW8330	METHOD	1,3-dinitrobenzene	355	U	355	R	62.0	355	ug/Kg	SS
WG	NDA0321FD1	FD	SW8330	METHOD	1,3-dinitrobenzene	5	U	5	UJ	0.64	5.0	ug/L	SS
WG	NDW06GW01-R01	N	SW8330	METHOD	1,3-dinitrobenzene	2.5	U	2.5	UJ	0.065	2.5	ug/L	SS
WG	NDW06GW02-R01	N	SW8330	METHOD	1,3-dinitrobenzene	2.5	U	2.5	UJ	0.065	2.5	ug/L	SS
WG	NDW06GW03-R01	N	SW8330	METHOD	1,3-dinitrobenzene	2.5	U	2.5	UJ	0.065	2.5	ug/L	SS
WG	NDW06GW05-R01	N	SW8330	METHOD	1,3-dinitrobenzene	2.5	U	2.5	UJ	0.065	2.5	ug/L	SS
WG	NDW06GW06-R01	N	SW8330	METHOD	1,3-dinitrobenzene	2.5	U	2.5	UJ	0.065	2.5	ug/L	SS
WG	NDW06GW04-R01	N	SW8330	METHOD	1,3-dinitrobenzene	2.5	U	2.5	UJ	0.065	2.5	ug/L	SS
WG	NDW06GW07-R01	N	SW8330	METHOD	1,3-dinitrobenzene	2.5	U	2.5	UJ	0.065	2.5	ug/L	SS
WG	NDW06GW08-R01	N	SW8330	METHOD	1,3-dinitrobenzene	2.5	U	2.5	UJ	0.065	2.5	ug/L	SS
WG	NDA005	N	SW8330	METHOD	1,3-dinitrobenzene	5	U	5	UJ	0.64	5.0	ug/L	SS
WG	NDA006	N	SW8330	METHOD	1,3-dinitrobenzene	5	U	5	UJ	0.64	5.0	ug/L	SS
WG	NDA008	N	SW8330	METHOD	1,3-dinitrobenzene	5	U	5	UJ	0.64	5.0	ug/L	SS
WG	NDA009	N	SW8330	METHOD	1,3-dinitrobenzene	5	U	5	UJ	0.64	5.0	ug/L	SS
WG	NDA012	N	SW8330	METHOD	1,3-dinitrobenzene	5	U	5	UJ	0.64	5.0	ug/L	SS
WS	NDA037	N	SW8330	METHOD	1,3-dinitrobenzene	5	U	5	UJ	0.64	5.0	ug/L	SS
WS	NDA039	N	SW8330	METHOD	1,3-dinitrobenzene	5	U	5	UJ	0.64	5.0	ug/L	SS
WS	NDA300	N	SW8330	METHOD	1,3-dinitrobenzene	5	U	5	UJ	0.64	5.0	ug/L	SS
SS	NDA104FD1	FD	SW8330	METHOD	2,4,6-trinitrotoluene	355	U	355	R	47.0	355	ug/Kg	SS
WG	NDA0321FD1	FD	SW8330	METHOD	2,4,6-trinitrotoluene	5	U	5	UJ	0.40	5.0	ug/L	SS
WG	NDW06GW01-R01	N	SW8330	METHOD	2,4,6-trinitrotoluene	2.5	U	2.5	UJ	0.090	2.5	ug/L	SS
WG	NDW06GW02-R01	N	SW8330	METHOD	2,4,6-trinitrotoluene	2.5	U	2.5	UJ	0.090	2.5	ug/L	SS
WG	NDW06GW03-R01	N	SW8330	METHOD	2,4,6-trinitrotoluene	2.5	U	2.5	UJ	0.090	2.5	ug/L	SS

EXHIBIT 4
Change in Qualifier Through the Data Validation Process

Matrix	Sample ID	Sample Type	Analytical Method	Prep Method	Parameter	Lab Result	Lab Qual	Final Result	Final Qual	DL	RL	Units	DV Notes
WG	NDW06GW05-R01	N	SW8330	METHOD	2,4,6-trinitrotoluene	2.5	U	2.5	UJ	0.090	2.5	ug/L	SS
WG	NDW06GW06-R01	N	SW8330	METHOD	2,4,6-trinitrotoluene	2.5	U	2.5	UJ	0.090	2.5	ug/L	SS
WG	NDW06GW04-R01	N	SW8330	METHOD	2,4,6-trinitrotoluene	2.5	U	2.5	UJ	0.090	2.5	ug/L	SS
WG	NDW06GW07-R01	N	SW8330	METHOD	2,4,6-trinitrotoluene	2.5	U	2.5	UJ	0.090	2.5	ug/L	SS
WG	NDW06GW08-R01	N	SW8330	METHOD	2,4,6-trinitrotoluene	2.5	U	2.5	UJ	0.090	2.5	ug/L	SS
WG	NDA005	N	SW8330	METHOD	2,4,6-trinitrotoluene	5	U	5	UJ	0.40	5.0	ug/L	SS
WG	NDA006	N	SW8330	METHOD	2,4,6-trinitrotoluene	5	U	5	UJ	0.40	5.0	ug/L	SS
WG	NDA008	N	SW8330	METHOD	2,4,6-trinitrotoluene	5	U	5	UJ	0.40	5.0	ug/L	SS
WG	NDA009	N	SW8330	METHOD	2,4,6-trinitrotoluene	5	U	5	UJ	0.40	5.0	ug/L	SS
WG	NDA012	N	SW8330	METHOD	2,4,6-trinitrotoluene	5	U	5	UJ	0.40	5.0	ug/L	SS
WS	NDA037	N	SW8330	METHOD	2,4,6-trinitrotoluene	5	U	5	UJ	0.40	5.0	ug/L	SS
WS	NDA039	N	SW8330	METHOD	2,4,6-trinitrotoluene	5	U	5	UJ	0.40	5.0	ug/L	SS
WS	NDA300	N	SW8330	METHOD	2,4,6-trinitrotoluene	5	U	5	UJ	0.40	5.0	ug/L	SS
SS	NDA104FD1	FD	SW8330	METHOD	2,4-Dinitrotoluene	355	U	355	R	43.0	355	ug/Kg	SS
WG	NDA0321FD1	FD	SW8330	METHOD	2,4-Dinitrotoluene	5	U	5	UJ	0.60	5.0	ug/L	SS
WG	NDW06GW01-R01	N	SW8330	METHOD	2,4-Dinitrotoluene	2.5	U	2.5	UJ	0.30	2.5	ug/L	SS
WG	NDW06GW02-R01	N	SW8330	METHOD	2,4-Dinitrotoluene	2.5	U	2.5	UJ	0.30	2.5	ug/L	SS
WG	NDW06GW03-R01	N	SW8330	METHOD	2,4-Dinitrotoluene	2.5	U	2.5	UJ	0.30	2.5	ug/L	SS
WG	NDW06GW05-R01	N	SW8330	METHOD	2,4-Dinitrotoluene	2.5	U	2.5	UJ	0.30	2.5	ug/L	SS
WG	NDW06GW06-R01	N	SW8330	METHOD	2,4-Dinitrotoluene	2.5	U	2.5	UJ	0.30	2.5	ug/L	SS
WG	NDW06GW04-R01	N	SW8330	METHOD	2,4-Dinitrotoluene	2.5	U	2.5	UJ	0.30	2.5	ug/L	SS
WG	NDW06GW07-R01	N	SW8330	METHOD	2,4-Dinitrotoluene	2.5	U	2.5	UJ	0.30	2.5	ug/L	SS
WG	NDW06GW08-R01	N	SW8330	METHOD	2,4-Dinitrotoluene	2.5	U	2.5	UJ	0.30	2.5	ug/L	SS
WG	NDA005	N	SW8330	METHOD	2,4-Dinitrotoluene	5	U	5	UJ	0.60	5.0	ug/L	SS
WG	NDA006	N	SW8330	METHOD	2,4-Dinitrotoluene	5	U	5	UJ	0.60	5.0	ug/L	SS
WG	NDA008	N	SW8330	METHOD	2,4-Dinitrotoluene	5	U	5	UJ	0.60	5.0	ug/L	SS
WG	NDA009	N	SW8330	METHOD	2,4-Dinitrotoluene	5	U	5	UJ	0.60	5.0	ug/L	SS
WG	NDA012	N	SW8330	METHOD	2,4-Dinitrotoluene	5	U	5	UJ	0.60	5.0	ug/L	SS
WS	NDA037	N	SW8330	METHOD	2,4-Dinitrotoluene	5	U	5	UJ	0.60	5.0	ug/L	SS
WS	NDA039	N	SW8330	METHOD	2,4-Dinitrotoluene	5	U	5	UJ	0.60	5.0	ug/L	SS
WS	NDA300	N	SW8330	METHOD	2,4-Dinitrotoluene	5	U	5	UJ	0.60	5.0	ug/L	SS
SS	NDA104FD1	FD	SW8330	METHOD	2,6-Dinitrotoluene	355	U	355	R	64.0	355	ug/Kg	SS
WG	NDA0321FD1	FD	SW8330	METHOD	2,6-Dinitrotoluene	5	U	5	UJ	0.50	5.0	ug/L	SS
WG	NDW06GW01-R01	N	SW8330	METHOD	2,6-Dinitrotoluene	2.5	U	2.5	UJ	0.36	2.5	ug/L	SS
WG	NDW06GW02-R01	N	SW8330	METHOD	2,6-Dinitrotoluene	2.5	U	2.5	UJ	0.36	2.5	ug/L	SS
WG	NDW06GW03-R01	N	SW8330	METHOD	2,6-Dinitrotoluene	2.5	U	2.5	UJ	0.36	2.5	ug/L	SS
WG	NDW06GW05-R01	N	SW8330	METHOD	2,6-Dinitrotoluene	2.5	U	2.5	UJ	0.36	2.5	ug/L	SS
WG	NDW06GW06-R01	N	SW8330	METHOD	2,6-Dinitrotoluene	2.5	U	2.5	UJ	0.36	2.5	ug/L	SS
WG	NDW06GW04-R01	N	SW8330	METHOD	2,6-Dinitrotoluene	2.5	U	2.5	UJ	0.36	2.5	ug/L	SS
WG	NDW06GW07-R01	N	SW8330	METHOD	2,6-Dinitrotoluene	2.5	U	2.5	UJ	0.36	2.5	ug/L	SS
WG	NDW06GW08-R01	N	SW8330	METHOD	2,6-Dinitrotoluene	2.5	U	2.5	UJ	0.36	2.5	ug/L	SS
WG	NDA005	N	SW8330	METHOD	2,6-Dinitrotoluene	5	U	5	UJ	0.50	5.0	ug/L	SS
WG	NDA006	N	SW8330	METHOD	2,6-Dinitrotoluene	5	U	5	UJ	0.50	5.0	ug/L	SS
WG	NDA008	N	SW8330	METHOD	2,6-Dinitrotoluene	5	U	5	UJ	0.50	5.0	ug/L	SS
WG	NDA009	N	SW8330	METHOD	2,6-Dinitrotoluene	5	U	5	UJ	0.50	5.0	ug/L	SS

EXHIBIT 4
Change in Qualifier Through the Data Validation Process

Matrix	Sample ID	Sample Type	Analytical Method	Prep Method	Parameter	Lab Result	Lab Qual	Final Result	Final Qual	DL	RL	Units	DV Notes
WG	NDA012	N	SW8330	METHOD	2,6-Dinitrotoluene	5	U	5	UJ	0.50	5.0	ug/L	SS
WS	NDA037	N	SW8330	METHOD	2,6-Dinitrotoluene	5	U	5	UJ	0.50	5.0	ug/L	SS
WS	NDA039	N	SW8330	METHOD	2,6-Dinitrotoluene	5	U	5	UJ	0.50	5.0	ug/L	SS
WS	NDA300	N	SW8330	METHOD	2,6-Dinitrotoluene	5	U	5	UJ	0.50	5.0	ug/L	SS
SS	NDA104FD1	FD	SW8330	METHOD	2-nitrotoluene	355	U	355	R	91.0	355	ug/Kg	SS
WG	NDA0321FD1	FD	SW8330	METHOD	2-nitrotoluene	5	U	5	UJ	0.64	5.0	ug/L	SS
WG	NDW06GW01-R01	N	SW8330	METHOD	2-nitrotoluene	2.5	U	2.5	UJ	0.24	2.5	ug/L	SS
WG	NDW06GW02-R01	N	SW8330	METHOD	2-nitrotoluene	2.5	U	2.5	UJ	0.24	2.5	ug/L	SS
WG	NDW06GW03-R01	N	SW8330	METHOD	2-nitrotoluene	2.5	U	2.5	UJ	0.24	2.5	ug/L	SS
WG	NDW06GW05-R01	N	SW8330	METHOD	2-nitrotoluene	2.5	U	2.5	UJ	0.24	2.5	ug/L	SS
WG	NDW06GW06-R01	N	SW8330	METHOD	2-nitrotoluene	2.5	U	2.5	UJ	0.24	2.5	ug/L	SS
WG	NDW08GW04-R01	N	SW8330	METHOD	2-nitrotoluene	2.5	U	2.5	UJ	0.24	2.5	ug/L	SS
WG	NDW06GW07-R01	N	SW8330	METHOD	2-nitrotoluene	2.5	U	2.5	UJ	0.24	2.5	ug/L	SS
WG	NDW06GW08-R01	N	SW8330	METHOD	2-nitrotoluene	2.5	U	2.5	UJ	0.24	2.5	ug/L	SS
WG	NDA005	N	SW8330	METHOD	2-nitrotoluene	5	U	5	UJ	0.64	5.0	ug/L	SS
WG	NDA006	N	SW8330	METHOD	2-nitrotoluene	5	U	5	UJ	0.64	5.0	ug/L	SS
WG	NDA008	N	SW8330	METHOD	2-nitrotoluene	5	U	5	UJ	0.64	5.0	ug/L	SS
WG	NDA009	N	SW8330	METHOD	2-nitrotoluene	5	U	5	UJ	0.64	5.0	ug/L	SS
WG	NDA012	N	SW8330	METHOD	2-nitrotoluene	5	U	5	UJ	0.64	5.0	ug/L	SS
WS	NDA037	N	SW8330	METHOD	2-nitrotoluene	5	U	5	UJ	0.64	5.0	ug/L	SS
WS	NDA039	N	SW8330	METHOD	2-nitrotoluene	5	U	5	UJ	0.64	5.0	ug/L	SS
WS	NDA300	N	SW8330	METHOD	2-nitrotoluene	5	U	5	UJ	0.64	5.0	ug/L	SS
SS	NDA104FD1	FD	SW8330	METHOD	3-nitrotoluene	355	U	355	R	136	355	ug/Kg	SS
WG	NDA0321FD1	FD	SW8330	METHOD	3-nitrotoluene	5	U	5	UJ	0.64	5.0	ug/L	SS
WG	NDW06GW01-R01	N	SW8330	METHOD	3-nitrotoluene	2.5	U	2.5	UJ	0.50	2.5	ug/L	SS
WG	NDW06GW02-R01	N	SW8330	METHOD	3-nitrotoluene	2.5	U	2.5	UJ	0.50	2.5	ug/L	SS
WG	NDW06GW03-R01	N	SW8330	METHOD	3-nitrotoluene	2.5	U	2.5	UJ	0.50	2.5	ug/L	SS
WG	NDW06GW05-R01	N	SW8330	METHOD	3-nitrotoluene	2.5	U	2.5	UJ	0.50	2.5	ug/L	SS
WG	NDW06GW06-R01	N	SW8330	METHOD	3-nitrotoluene	2.5	U	2.5	UJ	0.50	2.5	ug/L	SS
WG	NDW06GW04-R01	N	SW8330	METHOD	3-nitrotoluene	2.5	U	2.5	UJ	0.50	2.5	ug/L	SS
WG	NDW06GW07-R01	N	SW8330	METHOD	3-nitrotoluene	2.5	U	2.5	UJ	0.50	2.5	ug/L	SS
WG	NDW06GW08-R01	N	SW8330	METHOD	3-nitrotoluene	2.5	U	2.5	UJ	0.50	2.5	ug/L	SS
WG	NDA005	N	SW8330	METHOD	3-nitrotoluene	5	U	5	UJ	0.64	5.0	ug/L	SS
WG	NDA006	N	SW8330	METHOD	3-nitrotoluene	5	U	5	UJ	0.64	5.0	ug/L	SS
WG	NDA008	N	SW8330	METHOD	3-nitrotoluene	5	U	5	UJ	0.64	5.0	ug/L	SS
WG	NDA009	N	SW8330	METHOD	3-nitrotoluene	5	U	5	UJ	0.64	5.0	ug/L	SS
WG	NDA012	N	SW8330	METHOD	3-nitrotoluene	5	U	5	UJ	0.64	5.0	ug/L	SS
WS	NDA037	N	SW8330	METHOD	3-nitrotoluene	5	U	5	UJ	0.64	5.0	ug/L	SS
WS	NDA039	N	SW8330	METHOD	3-nitrotoluene	5	U	5	UJ	0.64	5.0	ug/L	SS
WS	NDA300	N	SW8330	METHOD	3-nitrotoluene	5	U	5	UJ	0.64	5.0	ug/L	SS
SS	NDA104FD1	FD	SW8330	METHOD	4-nitrotoluene	355	U	355	R	91.0	355	ug/Kg	SS
WG	NDA0321FD1	FD	SW8330	METHOD	4-nitrotoluene	5	U	5	UJ	0.80	5.0	ug/L	SS
WG	NDW06GW01-R01	N	SW8330	METHOD	4-nitrotoluene	2.5	U	2.5	UJ	0.28	2.5	ug/L	SS
WG	NDW06GW02-R01	N	SW8330	METHOD	4-nitrotoluene	2.5	U	2.5	UJ	0.28	2.5	ug/L	SS
WG	NDW06GW03-R01	N	SW8330	METHOD	4-nitrotoluene	2.5	U	2.5	UJ	0.28	2.5	ug/L	SS

EXHIBIT 4
Change in Qualifier Through the Data Validation Process

Matrix	Sample ID	Sample Type	Analytical Method	Prep Method	Parameter	Lab Result	Lab Qual	Final Result	Final Qual	DL	RL	Units	DV Notes
WG	NDW06GW05-R01	N	SW8330	METHOD	4-nitrotoluene	2.5	U	2.5	UJ	0.28	2.5	ug/L	SS
WG	NDW06GW06-R01	N	SW8330	METHOD	4-nitrotoluene	2.5	U	2.5	UJ	0.28	2.5	ug/L	SS
WG	NDW06GW04-R01	N	SW8330	METHOD	4-nitrotoluene	2.5	U	2.5	UJ	0.28	2.5	ug/L	SS
WG	NDW06GW07-R01	N	SW8330	METHOD	4-nitrotoluene	2.5	U	2.5	UJ	0.28	2.5	ug/L	SS
WG	NDW06GW08-R01	N	SW8330	METHOD	4-nitrotoluene	2.5	U	2.5	UJ	0.28	2.5	ug/L	SS
WG	NDA005	N	SW8330	METHOD	4-nitrotoluene	5	U	5	UJ	0.80	5.0	ug/L	SS
WG	NDA006	N	SW8330	METHOD	4-nitrotoluene	5	U	5	UJ	0.80	5.0	ug/L	SS
WG	NDA008	N	SW8330	METHOD	4-nitrotoluene	5	U	5	UJ	0.80	5.0	ug/L	SS
WG	NDA009	N	SW8330	METHOD	4-nitrotoluene	5	U	5	UJ	0.80	5.0	ug/L	SS
WG	NDA012	N	SW8330	METHOD	4-nitrotoluene	5	U	5	UJ	0.80	5.0	ug/L	SS
WS	NDA037	N	SW8330	METHOD	4-nitrotoluene	5	U	5	UJ	0.80	5.0	ug/L	SS
WS	NDA039	N	SW8330	METHOD	4-nitrotoluene	5	U	5	UJ	0.80	5.0	ug/L	SS
WS	NDA300	N	SW8330	METHOD	4-nitrotoluene	5	U	5	UJ	0.80	5.0	ug/L	SS
SS	NDA104FD1	FD	SW8330	METHOD	Hexahydro-1,3,5-trinitro-1,3,5-triazine	355	U	355	R	37.0	355	ug/Kg	SS
WG	NDA0321FD1	FD	SW8330	METHOD	Hexahydro-1,3,5-trinitro-1,3,5-triazine	5	U	5	UJ	0.42	5.0	ug/L	SS
WG	NDW06GW01-R01	N	SW8330	METHOD	Hexahydro-1,3,5-trinitro-1,3,5-triazine	2.5	U	2.5	UJ	0.16	2.5	ug/L	SS
WG	NDW06GW02-R01	N	SW8330	METHOD	Hexahydro-1,3,5-trinitro-1,3,5-triazine	2.5	U	2.5	UJ	0.16	2.5	ug/L	SS
WG	NDW06GW03-R01	N	SW8330	METHOD	Hexahydro-1,3,5-trinitro-1,3,5-triazine	2.5	U	2.5	UJ	0.16	2.5	ug/L	SS
WG	NDW06GW05-R01	N	SW8330	METHOD	Hexahydro-1,3,5-trinitro-1,3,5-triazine	2.5	U	2.5	UJ	0.16	2.5	ug/L	SS
WG	NDW06GW06-R01	N	SW8330	METHOD	Hexahydro-1,3,5-trinitro-1,3,5-triazine	2.5	U	2.5	UJ	0.16	2.5	ug/L	SS
WG	NDW06GW04-R01	N	SW8330	METHOD	Hexahydro-1,3,5-trinitro-1,3,5-triazine	2.5	U	2.5	UJ	0.16	2.5	ug/L	SS
WG	NDW06GW07-R01	N	SW8330	METHOD	Hexahydro-1,3,5-trinitro-1,3,5-triazine	2.5	U	2.5	UJ	0.16	2.5	ug/L	SS
WG	NDW06GW08-R01	N	SW8330	METHOD	Hexahydro-1,3,5-trinitro-1,3,5-triazine	2.5	U	2.5	UJ	0.16	2.5	ug/L	SS
WG	NDA005	N	SW8330	METHOD	Hexahydro-1,3,5-trinitro-1,3,5-triazine	5	U	5	UJ	0.42	5.0	ug/L	SS
WG	NDA006	N	SW8330	METHOD	Hexahydro-1,3,5-trinitro-1,3,5-triazine	5	U	5	UJ	0.42	5.0	ug/L	SS
WG	NDA008	N	SW8330	METHOD	Hexahydro-1,3,5-trinitro-1,3,5-triazine	5	U	5	UJ	0.42	5.0	ug/L	SS
WG	NDA009	N	SW8330	METHOD	Hexahydro-1,3,5-trinitro-1,3,5-triazine	5	U	5	UJ	0.42	5.0	ug/L	SS
WG	NDA012	N	SW8330	METHOD	Hexahydro-1,3,5-trinitro-1,3,5-triazine	5	U	5	UJ	0.42	5.0	ug/L	SS
WS	NDA037	N	SW8330	METHOD	Hexahydro-1,3,5-trinitro-1,3,5-triazine	5	U	5	UJ	0.42	5.0	ug/L	SS
WS	NDA039	N	SW8330	METHOD	Hexahydro-1,3,5-trinitro-1,3,5-triazine	5	U	5	UJ	0.42	5.0	ug/L	SS
WS	NDA300	N	SW8330	METHOD	Hexahydro-1,3,5-trinitro-1,3,5-triazine	5	U	5	UJ	0.42	5.0	ug/L	SS
SS	NDA104FD1	FD	SW8330	METHOD	Nitrobenzene	355	U	355	R	91.0	355	ug/Kg	SS
WG	NDA0321FD1	FD	SW8330	METHOD	Nitrobenzene	5	U	5	UJ	0.74	5.0	ug/L	SS
WG	NDW06GW01-R01	N	SW8330	METHOD	Nitrobenzene	2.5	U	2.5	UJ	0.13	2.5	ug/L	SS
WG	NDW06GW02-R01	N	SW8330	METHOD	Nitrobenzene	2.5	U	2.5	UJ	0.13	2.5	ug/L	SS
WG	NDW06GW03-R01	N	SW8330	METHOD	Nitrobenzene	2.5	U	2.5	UJ	0.13	2.5	ug/L	SS
WG	NDW06GW05-R01	N	SW8330	METHOD	Nitrobenzene	2.5	U	2.5	UJ	0.13	2.5	ug/L	SS
WG	NDW06GW06-R01	N	SW8330	METHOD	Nitrobenzene	2.5	U	2.5	UJ	0.13	2.5	ug/L	SS
WG	NDW06GW04-R01	N	SW8330	METHOD	Nitrobenzene	2.5	U	2.5	UJ	0.13	2.5	ug/L	SS
WG	NDW06GW07-R01	N	SW8330	METHOD	Nitrobenzene	2.5	U	2.5	UJ	0.13	2.5	ug/L	SS
WG	NDW06GW08-R01	N	SW8330	METHOD	Nitrobenzene	2.5	U	2.5	UJ	0.13	2.5	ug/L	SS
WG	NDA005	N	SW8330	METHOD	Nitrobenzene	5	U	5	UJ	0.74	5.0	ug/L	SS
WG	NDA006	N	SW8330	METHOD	Nitrobenzene	5	U	5	UJ	0.74	5.0	ug/L	SS
WG	NDA008	N	SW8330	METHOD	Nitrobenzene	5	U	5	UJ	0.74	5.0	ug/L	SS
WG	NDA009	N	SW8330	METHOD	Nitrobenzene	5	U	5	UJ	0.74	5.0	ug/L	SS

EXHIBIT 4
Change in Qualifier Through the Data Validation Process

Matrix	Sample ID	Sample Type	Analytical Method	Prep Method	Parameter	Lab Result	Lab Qual	Final Result	Final Qual	DL	RL	Units	DV Notes
WG	NDA012	N	SW8330	METHOD	Nitrobenzene	5	U	5	UJ	0.74	5.0	ug/L	SS
WS	NDA037	N	SW8330	METHOD	Nitrobenzene	5	U	5	UJ	0.74	5.0	ug/L	SS
WS	NDA039	N	SW8330	METHOD	Nitrobenzene	5	U	5	UJ	0.74	5.0	ug/L	SS
WS	NDA300	N	SW8330	METHOD	Nitrobenzene	5	U	5	UJ	0.74	5.0	ug/L	SS
SS	NDA104FD1	FD	SW8330	METHOD	octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine	355	U	355	R	176	355	ug/Kg	SS
WG	NDA0321FD1	FD	SW8330	METHOD	octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine	5	U	5	UJ	0.30	5.0	ug/L	SS
WG	NDW06GW01-R01	N	SW8330	METHOD	octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine	2.5	U	2.5	UJ	0.34	2.5	ug/L	SS
WG	NDW06GW02-R01	N	SW8330	METHOD	octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine	2.5	U	2.5	UJ	0.34	2.5	ug/L	SS
WG	NDW06GW03-R01	N	SW8330	METHOD	octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine	2.5	U	2.5	UJ	0.34	2.5	ug/L	SS
WG	NDW06GW05-R01	N	SW8330	METHOD	octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine	2.5	U	2.5	UJ	0.34	2.5	ug/L	SS
WG	NDW06GW06-R01	N	SW8330	METHOD	octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine	2.5	U	2.5	UJ	0.34	2.5	ug/L	SS
WG	NDW06GW04-R01	N	SW8330	METHOD	octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine	2.5	U	2.5	UJ	0.34	2.5	ug/L	SS
WG	NDW06GW07-R01	N	SW8330	METHOD	octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine	2.5	U	2.5	UJ	0.34	2.5	ug/L	SS
WG	NDW06GW08-R01	N	SW8330	METHOD	octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine	2.5	U	2.5	UJ	0.34	2.5	ug/L	SS
WG	NDA005	N	SW8330	METHOD	octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine	5	U	5	UJ	0.30	5.0	ug/L	SS
WG	NDA006	N	SW8330	METHOD	octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine	5	U	5	UJ	0.30	5.0	ug/L	SS
WG	NDA008	N	SW8330	METHOD	octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine	5	U	5	UJ	0.30	5.0	ug/L	SS
WG	NDA009	N	SW8330	METHOD	octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine	5	U	5	UJ	0.30	5.0	ug/L	SS
WG	NDA012	N	SW8330	METHOD	octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine	5	U	5	UJ	0.30	5.0	ug/L	SS
SS	NDA104FD1	FD	SW8330	METHOD	tetryl	355	U	355	R	92.0	355	ug/Kg	SS
WG	NDA0321FD1	FD	SW8330	METHOD	tetryl	5	U	5	UJ	1.1	5.0	ug/L	SS
WG	NDW06GW01-R01	N	SW8330	METHOD	tetryl	2.5	U	2.5	UJ	0.32	2.5	ug/L	SS
WG	NDW06GW02-R01	N	SW8330	METHOD	tetryl	2.5	U	2.5	UJ	0.32	2.5	ug/L	SS
WG	NDW06GW03-R01	N	SW8330	METHOD	tetryl	2.5	U	2.5	UJ	0.32	2.5	ug/L	SS
WG	NDW06GW05-R01	N	SW8330	METHOD	tetryl	2.5	U	2.5	UJ	0.32	2.5	ug/L	SS
WG	NDW06GW06-R01	N	SW8330	METHOD	tetryl	2.5	U	2.5	UJ	0.32	2.5	ug/L	SS
WG	NDW06GW04-R01	N	SW8330	METHOD	tetryl	2.5	U	2.5	UJ	0.32	2.5	ug/L	SS
WG	NDW06GW07-R01	N	SW8330	METHOD	tetryl	2.5	U	2.5	UJ	0.32	2.5	ug/L	SS
WG	NDW06GW08-R01	N	SW8330	METHOD	tetryl	2.5	U	2.5	UJ	0.32	2.5	ug/L	SS
WG	NDA005	N	SW8330	METHOD	tetryl	5	U	5	UJ	1.1	5.0	ug/L	SS
WG	NDA006	N	SW8330	METHOD	tetryl	5	U	5	UJ	1.1	5.0	ug/L	SS
WG	NDA008	N	SW8330	METHOD	tetryl	5	U	5	UJ	1.1	5.0	ug/L	SS
WG	NDA009	N	SW8330	METHOD	tetryl	5	U	5	UJ	1.1	5.0	ug/L	SS
WG	NDA012	N	SW8330	METHOD	tetryl	5	U	5	UJ	1.1	5.0	ug/L	SS
WS	NDA037	N	SW8330	METHOD	tetryl	5	U	5	UJ	1.1	5.0	ug/L	SS
WS	NDA039	N	SW8330	METHOD	tetryl	5	U	5	UJ	1.1	5.0	ug/L	SS
WS	NDA300	N	SW8330	METHOD	tetryl	5	U	5	UJ	1.1	5.0	ug/L	SS
WS	NDA037	N	SW8330	METHOD	octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine	5	U	5	UJ	0.30	5.0	ug/L	SS , CC
WS	NDA039	N	SW8330	METHOD	octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine	5	U	5	UJ	0.30	5.0	ug/L	SS, CC
WS	NDA300	N	SW8330	METHOD	octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine	5	U	5	UJ	0.30	5.0	ug/L	SS, CC
WG	NDA008	N	SW8081	SW3510	alpha bhc	0.01	U	0.01	UJ	0.010	0.010	ug/L	SS, IC
WG	NDA008	N	SW8081	SW3510	gamma bhc (lindane)	0.01	U	0.01	UJ	0.010	0.010	ug/L	SS, IC
SS	NDA084	N	SW8260B	SW5030	1,1,2,2-Tetrachloroethane	13	U	13	UJ	0.20	13.0	ug/Kg	SS, IS

APPENDIX J ADDENDUM
Internal Email, STL Inc.
Former NASD, Vieques, Puerto Rico

-----Original Message-----
From: lpenfold@stl-inc.com [mailto:lpenfold@stl-inc.com]
Sent: Tuesday, December 30, 2003 3:46 PM
To: cknudsen@stl-inc.com; rburrows@stl-inc.com; Walker, Deborah D
Cc: rfrederici@stl-inc.com; ccarter@stl-inc.com
Subject: Perchlorate in Lab Detergents

We have tested two different lots of Alconox, one supplied by USACE/CX and one from a box that we had in the lab. We also tested a brand of liquid lab detergent that we use more frequently these days called NeuTrad (made by Decon Laboratories).

STL's Alconox Detergent

We tested the supply from our own lab by IC/UV (314.0) and LC/MS/MS). We prepared the sample by dissolving 10g of powdered Alconox in 100 mL, with subsequent dilutions as needed. The effective final dilution for the Alconox analyzed by LC/MS/MS was 5,000x. The final perchlorate result was 2.5 mg/kg, which is orders of magnitude above our reporting limit.

USACE Alconox Detergent

The Alconox sample provided by CX was tested by LC/MS/MS alone. We reported the final result as "ND", i.e, non-detect, but there may have been some perchlorate there. It produced a tiny peak below our long-term MDL. The tiny peak had all the requisite ions (mass 99 transition to 83 and mass 101 transition to 85), but the quantitiation was too unreliable to accurately calculate ion ratios (part of the qualitative control of our procedure).

STL's NeuTrad Detergent

We analyzed a sample of this material by LC/MS/MS at the same time that the USACE Alconox was tested. The NeuTrad detergent produced a confirmed postive result just a bit lower than our Alconox sample (approximately 1.5 mg/kg if I remember correctly).

All of the mass spectrometer qualitative criteria were met. There were no apparent interfences. All associated QC was excellent. There is no doubt in my mind that there is perchlorate in some lab detergents. Apparently the perchlorate concentrations can vary by orders of magnitude. Here at STL Denver, this did not lead to any changes in our procedures. We never were using labware washed in soap and water, instead we use disposable bottles for sample collection and disposable tubes for storing dilutions and standards. However, it might be something to assess at other labs. Please feel free to share this information.

APPENDIX K

Ecological Screening Values for Surface Soil

Chemical	Screening Value	Units	Reference
1,2,4-Trichlorobenzene	20	mg/kg	Efroymson, 1997a
1,2-Dichloroethane	4	mg/kg	Ministry of Housing, Spatial Planning and Environment, 1994
1,2-Dichloropropane	700	mg/kg	Efroymson, 1997a
1,4-Dichlorobenzene	20	mg/kg	Efroymson, 1997a
2,4,5-Trichlorophenol	4	mg/kg	Efroymson, 1997b
2,4,6-Trichlorophenol	10	mg/kg	Efroymson, 1997a
2,4-Dinitrophenol	20	mg/kg	Efroymson, 1997b
3-Chloropropene (Allyl chloride)	7	mg/kg	Efroymson, 1997b
4,4`-DDD	0.0025	mg/kg	Ministry of Housing, Spatial Planning and Environment, 1994
4,4`-DDE	0.0025	mg/kg	Ministry of Housing, Spatial Planning and Environment, 1994
4,4`-DDT	0.0025	mg/kg	Ministry of Housing, Spatial Planning and Environment, 1994
4-Nitrophenol	7	mg/kg	Efroymson, 1997a
Acenaphthene	20	mg/kg	Efroymson, 1997b
Acrylonitrile	1000	mg/kg	Efroymson, 1997a
Aldrin	0.0025	mg/kg	Ministry of Housing, Spatial Planning and Environment, 1994
alpha-BHC	0.0025	mg/kg	Ministry of Housing, Spatial Planning and Environment, 1994
Aluminum	50	mg/kg	Efroymson, 1997b
Anthracene	0.1	mg/kg	Beyer, 1990
Antimony	5	mg/kg	Efroymson, 1997b
Aroclor-1016	40	mg/kg	Efroymson, 1997b
Aroclor-1221	40	mg/kg	Efroymson, 1997b
Aroclor-1232	40	mg/kg	Efroymson, 1997b
Aroclor-1242	40	mg/kg	Efroymson, 1997b
Aroclor-1248	40	mg/kg	Efroymson, 1997b
Aroclor-1254	40	mg/kg	Efroymson, 1997b
Aroclor-1260	40	mg/kg	Efroymson, 1997b
Aroclor-1268	40	mg/kg	Efroymson, 1997b
Arsenic	10	mg/kg	Efroymson, 1997b
Atrazine	0.00005	mg/kg	Ministry of Housing, Spatial Planning and Environment, 1994
Barium	500	mg/kg	Efroymson, 1997b
Benzene	0.05	mg/kg	Ministry of Housing, Spatial Planning and Environment, 1994
Benzo(a)pyrene	0.1	mg/kg	Beyer, 1990
Benzo(g,h,i)perylene	1	mg/kg	Beyer, 1990
Beryllium	10	mg/kg	Efroymson, 1997b
beta-BHC	0.001	mg/kg	Ministry of Housing, Spatial Planning and Environment, 1994
Cadmium	4	mg/kg	Efroymson, 1997b
Carbon tetrachloride	1000	mg/kg	Efroymson, 1997a
Chlorobenzene	40	mg/kg	Efroymson, 1997a
Chromium	0.4	mg/kg	Efroymson, 1997a
Chromium, hexavalent	0.4	mg/kg	Efroymson, 1997a
Cobalt	20	mg/kg	Efroymson, 1997b
Copper	50	mg/kg	Efroymson, 1997a
Cyclohexane	0.1	mg/kg	Beyer, 1990
Dieldrin	0.0005	mg/kg	Ministry of Housing, Spatial Planning and Environment, 1994
Diethylphthalate	100	mg/kg	Efroymson, 1997b
Dimethylphthalate	200	mg/kg	Efroymson, 1997a
Di-n-butylphthalate	200	mg/kg	Efroymson, 1997b
Endrin	0.001	mg/kg	Ministry of Housing, Spatial Planning and Environment, 1994
Endrin aldehyde	0.1	mg/kg	Beyer, 1990
Endrin ketone	0.1	mg/kg	Beyer, 1990

APPENDIX K

Ecological Screening Values for Surface Soil

Chemical	Screening Value	Units	Reference
Ethylbenzene	0.05	mg/kg	Ministry of Housing, Spatial Planning and Environment, 1994
Fluoranthene	0.1	mg/kg	Beyer, 1990
Fluorene	30	mg/kg	Efroymson, 1997a
gamma-BHC (Lindane)	0.00005	mg/kg	Ministry of Housing, Spatial Planning and Environment, 1994
Hexachlorobenzene	1000	mg/kg	Efroymson, 1997a
Hexachlorocyclopentadiene	10	mg/kg	Efroymson, 1997b
Iron	200	mg/kg	Efroymson, 1997a
Lead	50	mg/kg	Efroymson, 1997b
Manganese	100	mg/kg	Efroymson, 1997a
Mercury	0.1	mg/kg	Efroymson, 1997a
Naphthalene	0.1	mg/kg	Beyer, 1990
Nickel	30	mg/kg	Efroymson, 1997b
Nitrobenzene	40	mg/kg	Efroymson, 1997a
N-Nitrosodiphenylamine	20	mg/kg	Efroymson, 1997a
Pentachlorobenzene	20	mg/kg	Efroymson, 1997a
Pentachlorophenol	3	mg/kg	Efroymson, 1997b
Phenanthrene	0.1	mg/kg	Beyer, 1990
Phenol	30	mg/kg	Efroymson, 1997a
Pyrene	0.1	mg/kg	Beyer, 1990
Pyridine	0.1	mg/kg	Ministry of Housing, Spatial Planning and Environment, 1994
Selenium	1	mg/kg	Efroymson, 1997b
Silver	2	mg/kg	Efroymson, 1997b
Styrene	300	mg/kg	Efroymson, 1997b
Tetrachloroethene	0.01	mg/kg	Ministry of Housing, Spatial Planning and Environment, 1994
Thallium	1	mg/kg	Efroymson, 1997b
Tin	50	mg/kg	Efroymson, 1997b
Titanium	1000	mg/kg	Efroymson, 1997a
Toluene	200	mg/kg	Efroymson, 1997b
trans-1,4-Dichloro-2-butene	1000	mg/kg	Efroymson, 1997a
Trichloroethene	0.001	mg/kg	Ministry of Housing, Spatial Planning and Environment, 1994
Vanadium	2	mg/kg	Efroymson, 1997b
Vinyl chloride	0.1	mg/kg	Ministry of Housing, Spatial Planning and Environment, 1994
Xylene (total)	0.05	mg/kg	Ministry of Housing, Spatial Planning and Environment, 1994
Zinc	50	mg/kg	Efroymson, 1997b

APPENDIX K

Ecological Screening Values for Surfacewater

Chemical	Screening Value	Units
1,1,1-Trichloroethane	200	ug/L
1,1,2,2-Tetrachloroethane	1.7	ug/L
1,1,2-Trichloroethane	6	ug/L
1,1-Dichloroethene	0.57	ug/L
1,2,4-Trichlorobenzene	260	ug/L
1,2-Dichlorobenzene	2700	ug/L
1,2-Dichloroethane	3.8	ug/L
1,2-Dichloroethene (total)	700	ug/L
1,2-Dichloropropane	5.2	ug/L
1,2-Diphenylhydrazine	0.4	ug/L
1,3-Dichlorobenzene	400	ug/L
1,4-Dichlorobenzene	400	ug/L
2,4,6-Trichlorophenol	21	ug/L
2,4-Dichlorophenol	93	ug/L
2,4-Dimethylphenol	540	ug/L
2,4-Dinitrophenol	70	ug/L
2,4-Dinitrotoluene	0.11	ug/L
2-Chloronaphthalene	1700	ug/L
2-Chlorophenol	120	ug/L
3,3`-Dichlorobenzidine	0.4	ug/L
4,4`-DDT	0.001	ug/L
4,4'-DDT, Dissolved	0.001	ug/L
Acenaphthene	1200	ug/L
Acrolein	320	ug/L
Acrylonitrile	0.59	ug/L
Aldrin	0.0014	ug/L
Anthracene	9600	ug/L
Antimony	4300	ug/L
Antimony, Dissolved	4300	ug/L
Aroclor-1016	0.03	ug/L
Aroclor-1016, Dissolved	0.03	ug/L
Aroclor-1221	0.03	ug/L
Aroclor-1221, Dissolved	0.03	ug/L
Aroclor-1232	0.03	ug/L
Aroclor-1232, Dissolved	0.03	ug/L
Aroclor-1242	0.03	ug/L
Aroclor-1242, Dissolved	0.03	ug/L
Aroclor-1248	0.03	ug/L
Aroclor-1248, Dissolved	0.03	ug/L
Aroclor-1254	0.03	ug/L
Aroclor-1254, Dissolved	0.03	ug/L
Aroclor-1260	0.03	ug/L
Aroclor-1260, Dissolved	0.03	ug/L
Aroclor-1268	0.03	ug/L
Arsenic	1.4	ug/L
Arsenic, Dissolved	1.4	ug/L
Azinphos methyl (Guthion)	0.01	ug/L

Benzene	12	ug/L
Benzidine	0.0012	ug/L
Benzo(a)anthracene	0.044	ug/L
Benzo(a)pyrene	0.044	ug/L
Benzo(b)fluoranthene	0.044	ug/L
Benzo(k)fluoranthene	0.044	ug/L
bis(2-Chloroethyl)ether	0.31	ug/L
bis(2-Ethylhexyl)phthalate	18	ug/L
Bromoform	43	ug/L
Butylbenzylphthalate	3000	ug/L
Cadmium	9.3	ug/L
Cadmium, Dissolved	9.3	ug/L
Carbon tetrachloride	2.5	ug/L
Chlordane	0.004	ug/L
Chlorobenzene	680	ug/L
Chloroform	57	ug/L
Chlorpyrifos (Dursban)	0.0056	ug/L
Chromium	50.4	ug/L
Chromium, Dissolved	50	ug/L
Chromium, hexavalent	50	ug/L
Chrysene	0.044	ug/L
Copper	3.7	ug/L
Copper, Dissolved	3.1	ug/L
Coumaphos	0.01	ug/L
Cyanide	1	ug/L
Cyanide, Total	1	ug/L
Demeton O	0.1	ug/L
Demeton O & S	0.1	ug/L
Demeton S	0.1	ug/L
Dibenz(a,h)anthracene	0.044	ug/L
Dibromochloromethane	5.6	ug/L
Dieldrin	0.0014	ug/L
Dieldrin, Dissolved	0.0014	ug/L
Diethylphthalate	23000	ug/L
Dimethylphthalate	313000	ug/L
Di-n-butylphthalate	2700	ug/L
Endosulfan I	0.056	ug/L
Endosulfan II	0.056	ug/L
Endrin	0.0023	ug/L
Ethylbenzene	3100	ug/L
Fenthion	40	ug/L
Fluoranthene	300	ug/L
Fluorene	1300	ug/L
gamma-BHC (Lindane)	0.16	ug/L
Heptachlor	0.0021	ug/L
Heptachlor epoxide	0.0036	ug/L
Hexachlorobenzene	0.0075	ug/L
Hexachlorobutadiene	4.4	ug/L
Hexachlorocyclopentadiene	240	ug/L
Hexachloroethane	19	ug/L
Indeno(1,2,3-cd)pyrene	0.044	ug/L
Isophorone	360	ug/L

Lead	8.1	ug/L
Lead, Dissolved	8.1	ug/L
Malathion	0.1	ug/L
Mercury	0.051	ug/L
Mercury, Dissolved	0.051	ug/L
Methoxychlor	0.03	ug/L
Methylene chloride	470	ug/L
Mirex	0.001	ug/L
Nickel	8.2	ug/L
Nickel, Dissolved	8.2	ug/L
Nitrobenzene	17	ug/L
Nitrogen	5000	ug/L
N-Nitrosodimethylamine	0.0069	ug/L
N-Nitroso-di-n-propylamine	0.05	ug/L
N-Nitrosodiphenylamine	50	ug/L
Pentachlorophenol	7.9	ug/L
Phenol	21000	ug/L
Pyrene	960	ug/L
Selenium	71	ug/L
Selenium, Dissolved	71	ug/L
Silver	1.9	ug/L
Silver, Dissolved	1.9	ug/L
Sulfide	2	ug/L
Tetrachloroethene	8	ug/L
Toluene	6800	ug/L
Toxaphene	0.0002	ug/L
Trichloroethene	27	ug/L
Vinyl chloride	2	ug/L
Zinc	81	ug/L
Zinc, Dissolved	81	ug/L

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APPENDIX K

Ecological Screening Values for Sediment

Chemical	Screening Value	Units	Reference
1,1,1-Trichloroethane	0.17	mg/kg	EPA 1996
1,1,2,2-Tetrachloroethane	0.94	mg/kg	EPA 1996
1,2,4-Trichlorobenzene	9.2	mg/kg	EPA 1996
1,2-Dichlorobenzene	0.34	mg/kg	EPA 1996
1,3-Dichlorobenzene	1.7	mg/kg	EPA 1996
1,4-Dichlorobenzene	0.35	mg/kg	EPA 1996
2-Methylnaphthalene	0.33	mg/kg	EPA 1995
4,4`-DDD	0.0033	mg/kg	EPA 1995
4,4`-DDE	0.0033	mg/kg	EPA 1995
4,4`-DDT	0.0033	mg/kg	EPA 1995
Acenaphthene	0.016	mg/kg	Long et. al. 1995
Acenaphthylene	0.33	mg/kg	EPA 1995
Anthracene	0.33	mg/kg	EPA 1995
Antimony	12	mg/kg	EPA 1995
Aroclor-1016	0.033	mg/kg	EPA 1995
Aroclor-1221	0.033	mg/kg	EPA 1995
Aroclor-1232	0.033	mg/kg	EPA 1995
Aroclor-1242	0.033	mg/kg	EPA 1995
Aroclor-1248	0.033	mg/kg	EPA 1995
Aroclor-1254	0.033	mg/kg	EPA 1995
Aroclor-1260	0.033	mg/kg	EPA 1995
Arsenic	7.24	mg/kg	MacDonald 1994
Benzo(a)anthracene	0.33	mg/kg	EPA 1995
Benzo(a)pyrene	0.33	mg/kg	EPA 1995
Benzo(b)fluoranthene	0.33	mg/kg	EPA 1995
Benzo(g,h,i)perylene	0.655	mg/kg	MacDonald 1994
Benzo(k)fluoranthene	0.33	mg/kg	EPA 1995
bis(2-Ethylhexyl)phthalate	0.182	mg/kg	MacDonald 1994
Cadmium	0.676	mg/kg	MacDonald 1994
Chlordane	0.0017	mg/kg	EPA 1995
Chromium	52.3	mg/kg	MacDonald 1994
Chrysene	0.33	mg/kg	EPA 1995
Copper	18.7	mg/kg	MacDonald 1994
Dibenz(a,h)anthracene	0.33	mg/kg	EPA 1995
Dieldrin	0.0033	mg/kg	EPA 1995
Endrin	0.0033	mg/kg	EPA 1995
Fluoranthene	0.33	mg/kg	EPA 1995
Fluorene	0.33	mg/kg	EPA 1995
gamma-BHC (Lindane)	0.0033	mg/kg	EPA 1995
Indeno(1,2,3-cd)pyrene	0.665	mg/kg	MacDonald 1994
Lead	30.2	mg/kg	MacDonald 1994
Mercury	0.13	mg/kg	MacDonald 1994
Naphthalene	0.33	mg/kg	EPA 1995
Nickel	15.9	mg/kg	MacDonald 1994
Phenanthrene	0.33	mg/kg	EPA 1995
Pyrene	0.33	mg/kg	EPA 1995
Silver	0.73	mg/kg	MacDonald 1994
Zinc	124	mg/kg	MacDonald 1994

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+++=Non-Standard Method Applied (See Section 2.3 of the "Region 9 PRGs Table User's Guide") sat=Soil Saturation (See Section 4.5) max=Ceiling limit (See Section 2.1) DAF=Dilution Attenuation Factor (See Section 2.5) CAS=Chemical Abstract Services

TOXICITY INFORMATION										CONTAMINANT	PRELIMINARY REMEDIAL GOALS (PRGs) "Direct Contact Exposure Pathways"								SOIL SCREENING LEVELS "Migration to Ground Water"	
SFo 1/(mg/kg-d)		RfDo (mg/kg-d)		SFi 1/(mg/kg-d)		RfDi (mg/kg-d)		VOC	skin abs. soils	CAS No.		Residential Soil (mg/kg)		Industrial Soil (mg/kg)		Ambient Air (ug/m^3)		Tap Water (ug/l)		DAF 20 (mg/kg)	DAF 1 (mg/kg)
8.7E-03	i	4.0E-03	i	8.7E-03	r	4.0E-03	r	0	0.10	30560-19-1	Acephate	5.6E+01	ca**	2.0E+02	ca*	7.7E-01	ca*	7.7E+00	ca*		
				7.7E-03	i	2.6E-03	i	1		75-07-0	Acetaldehyde	1.1E+01	ca**	2.3E+01	ca**	8.7E-01	ca*	1.7E+00	ca		
		2.0E-02	i			2.0E-02	r	0	0.10	34256-82-1	Acetochlor	1.2E+03	nc	1.2E+04	nc	7.3E+01	nc	7.3E+02	nc		
		1.0E-01	i			1.0E-01	r	1		67-64-1	Acetone	1.6E+03	nc	6.0E+03	nc	3.7E+02	nc	6.1E+02	nc	1.6E+01	8.0E-01
		8.0E-04	h			8.0E-04	r	0	0.10	75-86-5	Acetone cyanohydrin	4.9E+01	nc	4.9E+02	nc	2.9E+00	nc	2.9E+01	nc		
		1.7E-02	r			1.7E-02	i	1		75-05-8	**Acetonitrile**	4.2E+02	nc	1.8E+03	nc	6.2E+01	nc	1.0E+02	nc		
		2.0E-02	h			5.7E-06	i	1		107-02-8	Acrolein	1.0E-01	nc	3.4E-01	nc	2.1E-02	nc	4.2E-02	nc		
4.5E+00	i	2.0E-04	i	4.5E+00	i	2.0E-04	r	0	0.10	79-06-1	Acrylamide	1.1E-01	ca	3.8E-01	ca	1.5E-03	ca	1.5E-02	ca		
		5.0E-01	i			2.9E-04	i	0	0.10	79-10-7	Acrylic acid	2.9E+04	nc	1.0E+05	max	1.0E+00	nc	1.8E+04	nc		
5.4E-01	i	1.0E-03	h	2.4E-01	i	5.7E-04	i	1		107-13-1	Acrylonitrile	2.1E-01	ca*	4.9E-01	ca*	2.8E-02	ca*	3.9E-02	ca*		
8.1E-02	h	1.0E-02	i	8.0E-02	r	1.0E-02	r	0	0.10	15972-60-8	Alachlor	6.0E+00	ca	2.1E+01	ca	8.4E-02	ca	8.4E-01	ca		
		1.5E-01	i			1.5E-01	r	0	0.10	1596-84-5	Alar	9.2E+03	nc	9.2E+04	nc	5.5E+02	nc	5.5E+03	nc		
		1.0E-03	i			1.0E-03	r	0	0.10	116-06-3	Aldicarb	6.1E+01	nc	6.2E+02	nc	3.7E+00	nc	3.6E+01	nc		
		1.0E-03	i			1.0E-03	r	0	0.10	1646-88-4	Aldicarb sulfone	6.1E+01	nc	6.2E+02	nc	3.7E+00	nc	3.6E+01	nc		
1.7E+01	i	3.0E-05	i	1.7E+01	i	3.0E-05	r	0	0.10	309-00-2	Aldrin	2.9E-02	ca*	1.0E-01	ca	3.9E-04	ca	4.0E-03	ca	5.0E-01	2.0E-02
		2.5E-01	i			2.5E-01	r	0	0.10	74223-64-6	Ally	1.5E+04	nc	1.0E+05	max	9.1E+02	nc	9.1E+03	nc		
		5.0E-03	i			5.0E-03	r	0	0.10	107-18-6	Allyl alcohol	3.1E+02	nc	3.1E+03	nc	1.8E+01	nc	1.8E+02	nc		
		5.0E-02	h			2.9E-04	i	0	0.10	107-05-1	Allyl chloride	3.0E+03	nc	3.0E+04	nc	1.0E+00	nc	1.8E+03	nc		
		1.0E+00	n			1.4E-03	n	0		7429-90-5	Aluminum	7.6E+04	nc	1.0E+05	max	5.1E+00	nc	3.6E+04	nc		
		4.0E-04	i					0		20859-73-8	Aluminum phosphide	3.1E+01	nc	4.1E+02	nc			1.5E+01	nc		
		3.0E-04	i			3.0E-04	r	0	0.10	67485-29-4	Amdro	1.8E+01	nc	1.8E+02	nc	1.1E+00	nc	1.1E+01	nc		
		9.0E-03	i			9.0E-03	r	0	0.10	834-12-8	Ametryn	5.5E+02	nc	5.5E+03	nc	3.3E+01	nc	3.3E+02	nc		
		7.0E-02	h			7.0E-02	r	0	0.10	591-27-5	m-Aminophenol	4.3E+03	nc	4.3E+04	nc	2.6E+02	nc	2.6E+03	nc		
		2.0E-05	h			2.0E-05	r	0	0.10	504-24-5	4-Aminopyridine	1.2E+00	nc	1.2E+01	nc	7.3E-02	nc	7.3E-01	nc		
		2.5E-03	i			2.5E-03	r	0	0.10	33089-61-1	Amitraz	1.5E+02	nc	1.5E+03	nc	9.1E+00	nc	9.1E+01	nc		
						2.9E-02	i			7664-41-7	Ammonia					1.0E+02	nc				
		2.0E-01	i					0	0.10	7773-06-0	Ammonium sulfamate	1.2E+04	nc	1.0E+05	max			7.3E+03	nc		
5.7E-03	i	7.0E-03	n	5.7E-03	r	2.9E-04	i	0	0.10	62-53-3	Aniline	8.5E+01	ca**	3.0E+02	ca*	1.0E+00	nc	1.2E+01	ca*		
		4.0E-04	i					0		7440-36-0	Antimony and compounds	3.1E+01	nc	4.1E+02	nc			1.5E+01	nc	5.0E+00	3.0E-01
		5.0E-04	h					0		1314-60-9	Antimony pentoxide	3.9E+01	nc	5.1E+02	nc			1.8E+01	nc		
		9.0E-04	h					0		28300-74-5	Antimony potassium tartrate	7.0E+01	nc	9.2E+02	nc			3.3E+01	nc		
		4.0E-04	h					0		1332-81-6	Antimony tetroxide	3.1E+01	nc	4.1E+02	nc			1.5E+01	nc		
		4.0E-04	h			5.7E-05	i	0		1309-64-4	Antimony trioxide	3.1E+01	nc	4.1E+02	nc	2.1E-01	nc	1.5E+01	nc		
		1.3E-02	i			1.3E-02	r	0	0.10	74115-24-5	Apollo	7.9E+02	nc	8.0E+03	nc	4.7E+01	nc	4.7E+02	nc		
2.5E-02	i	5.0E-02	h	2.5E-02	i	5.0E-02	r	0	0.10	140-57-8	Aramite	1.9E+01	ca	6.9E+01	ca	2.7E-01	ca	2.7E+00	ca		
		3.0E-04	i					0	0.03	7440-38-2	Arsenic (noncancer endpoint)	2.2E+01	nc	2.6E+02	nc						

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TOXICITY INFORMATION										CONTAMINANT	PRELIMINARY REMEDIAL GOALS (PRGs) "Direct Contact Exposure Pathways"								SOIL SCREENING LEVELS "Migration to Ground Water"	
SFo 1/(mg/kg-d)		RfDo (mg/kg-d)		SFi 1/(mg/kg-d)		RfDi (mg/kg-d)		VOC	skin abs. soils	CAS No.		Residential Soil (mg/kg)		Industrial Soil (mg/kg)		Ambient Air (ug/m^3)		Tap Water (ug/l)		DAF 20 (mg/kg)	DAF 1 (mg/kg)
1.5E+00	i	3.0E-04	i	1.5E+01	i			0	0.03	7440-38-2	Arsenic (cancer endpoint)	3.9E-01	ca*	1.6E+00	ca	4.5E-04	ca	4.5E-02	ca	2.9E+01	1.0E+00
						1.4E-05	i	0		7784-42-1	Arsine (see arsenic for cancer endpoint)					5.2E-02	nc				
		9.0E-03	i			9.0E-03	r		0.10	76578-12-6	Assure	5.5E+02	nc	5.5E+03	nc	3.3E+01	nc	3.3E+02	nc		
		5.0E-02	i			5.0E-02	r	0	0.10	3337-71-1	Asulam	3.1E+03	nc	3.1E+04	nc	1.8E+02	nc	1.8E+03	nc		
2.2E-01	h	3.5E-02	h	2.2E-01	r	3.5E-02	r	0	0.10	1912-24-9	Atrazine	2.2E+00	ca	7.8E+00	ca	3.1E-02	ca	3.0E-01	ca		
		4.0E-04	i			4.0E-04	r	0	0.10	71751-41-2	Avermectin B1	2.4E+01	nc	2.5E+02	nc	1.5E+00	nc	1.5E+01	nc		
1.1E-01	i			1.1E-01	i			0	0.10	103-33-3	Azobenzene	4.4E+00	ca	1.6E+01	ca	6.2E-02	ca	6.1E-01	ca		
		7.0E-02	i			1.4E-04	h	0		7440-39-3	Barium and compounds	5.4E+03	nc	6.7E+04	nc	5.2E-01	nc	2.6E+03	nc	1.6E+03	8.2E+01
		4.0E-03	i			4.0E-03	r	0	0.10	114-26-1	Baygon	2.4E+02	nc	2.5E+03	nc	1.5E+01	nc	1.5E+02	nc		
		3.0E-02	i			3.0E-02	r	0	0.10	43121-43-3	Bayleton	1.8E+03	nc	1.8E+04	nc	1.1E+02	nc	1.1E+03	nc		
		2.5E-02	i			2.5E-02	r	0	0.10	68359-37-5	Baythroid	1.5E+03	nc	1.5E+04	nc	9.1E+01	nc	9.1E+02	nc		
		3.0E-01	i			3.0E-01	r	0	0.10	1861-40-1	Benefin	1.8E+04	nc	1.0E+05	max	1.1E+03	nc	1.1E+04	nc		
		5.0E-02	i			5.0E-02	r	0	0.10	17804-35-2	Benomyl	3.1E+03	nc	3.1E+04	nc	1.8E+02	nc	1.8E+03	nc		
		3.0E-02	i			3.0E-02	r	0	0.10	25057-89-0	Bentazon	1.8E+03	nc	1.8E+04	nc	1.1E+02	nc	1.1E+03	nc		
		1.0E-01	i			1.0E-01	r	0	0.10	100-52-7	Benzaldehyde	6.1E+03	nc	6.2E+04	nc	3.7E+02	nc	3.6E+03	nc		
5.5E-02	i	3.0E-03	n	2.9E-02	i	1.7E-03	n	1		71-43-2	Benzene	6.0E-01	ca*	1.3E+00	ca*	2.3E-01	ca*	3.4E-01	ca*	3.0E-02	2.0E-03
2.3E+02	i	3.0E-03	i	2.3E+02	i	3.0E-03	r	0	0.10	92-87-5	Benzidine	2.1E-03	ca	7.5E-03	ca	2.9E-05	ca	2.9E-04	ca		
		4.0E+00	i			4.0E+00	r	0	0.10	65-85-0	Benzoic acid	1.0E+05	max	1.0E+05	max	1.5E+04	nc	1.5E+05	nc	4.0E+02	2.0E+01
1.3E+01	i			1.3E+01	r			0	0.10	98-07-7	Benzotrichloride	3.7E-02	ca	1.3E-01	ca	5.2E-04	ca	5.2E-03	ca		
		3.0E-01	h			3.0E-01	r	0	0.10	100-51-6	Benzyl alcohol	1.8E+04	nc	1.0E+05	max	1.1E+03	nc	1.1E+04	nc		
1.7E-01	i	2.9E-03	r	1.7E-01	r	2.9E-03	n	1		100-44-7	**Benzyl chloride**	8.9E-01	ca*	2.2E+00	ca	4.0E-02	ca	6.6E-02	ca		
		2.0E-03	i	8.4E+00	i	5.7E-06	i	0		7440-41-7	Beryllium and compounds	1.5E+02	nc	1.9E+03	ca**	8.0E-04	ca*	7.3E+01	nc	6.3E+01	3.0E+00
		1.0E-04	i			1.0E-04	r	0	0.10	141-66-2	Bidrin	6.1E+00	nc	6.2E+01	nc	3.7E-01	nc	3.6E+00	nc		
		1.5E-02	i			1.5E-02	r	0	0.10	82657-04-3	Biphenthrin (Talstar)	9.2E+02	nc	9.2E+03	nc	5.5E+01	nc	5.5E+02	nc		
		5.0E-02	i			5.0E-02	r	1		92-52-4	1,1-Biphenyl	3.5E+02	sat	3.5E+02	sat	1.8E+02	nc	3.0E+02	nc		
1.1E+00	i			1.2E+00	i			1		111-44-4	Bis(2-chloroethyl)ether	2.1E-01	ca	5.5E-01	ca	5.8E-03	ca	9.8E-03	ca	4.0E-04	2.0E-05
7.0E-02	x	4.0E-02	i	3.5E-02	x	4.0E-02	r	1		39638-32-9	Bis(2-chloroisopropyl)ether	2.9E+00	ca	7.4E+00	ca	1.9E-01	ca	2.7E-01	ca		
2.2E+02	i			2.2E+02	i			1		542-88-1	Bis(chloromethyl)ether	1.9E-04	ca	4.3E-04	ca	3.1E-05	ca	5.2E-05	ca		
7.0E-02	x	4.0E-02	i	3.5E-02	x	4.0E-02	r	1		108-60-1	Bis(2-chloro-1-methylethyl)ether	2.9E+00	ca	7.4E+00	ca	1.9E-01	ca	2.7E-01	ca		
1.4E-02	i	2.0E-02	i	1.4E-02	r	2.2E-02	r	0	0.10	117-81-7	Bis(2-ethylhexyl)phthalate (DEHP)	3.5E+01	ca*	1.2E+02	ca	4.8E-01	ca	4.8E+00	ca		
		5.0E-02	i			5.0E-02	r	0	0.10	80-05-7	Bisphenol A	3.1E+03	nc	3.1E+04	nc	1.8E+02	nc	1.8E+03	nc		
		2.0E-01	i			5.7E-03	x	0		7440-42-8	**Boron**	1.6E+04	nc	1.0E+05	max	2.1E+01	nc	7.3E+03	nc		
						2.0E-04	h	0		7637-07-2	Boron trifluoride					7.3E-01	nc				
		4.00E-03	i							15541-45-4	**Bromate**	3.1E+02	nc	4.1E+03	nc	0.0E+00		1.5E+02	nc		
		2.0E-02	n			2.9E-03	n	1		108-86-1	Bromobenzene	2.8E+01	nc	9.2E+01	nc	1.0E+01	nc	2.0E+01	nc		
6.2E-02	i	2.0E-02	i	6.2E-02	r	2.0E-02	r	1		75-27-4	Bromodichloromethane	8.2E-01	ca	1.8E+00	ca	1.1E-01	ca	1.8E-01	ca	6.0E-01	3.0E-02

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SFo 1/(mg/kg-d)		RfDo (mg/kg-d)		SFi 1/(mg/kg-d)		RfDi (mg/kg-d)		VOC	skin abs. soils	CAS No.		Residential Soil (mg/kg)		Industrial Soil (mg/kg)		Ambient Air (ug/m^3)		Tap Water (ug/l)		DAF 20 (mg/kg)	DAF 1 (mg/kg)
7.9E-03	i	2.0E-02	i	3.9E-03	i	2.0E-02	r	0	0.10	75-25-2	Bromoform (tribromomethane)	6.2E+01	ca*	2.2E+02	ca*	1.7E+00	ca*	8.5E+00	ca*	8.0E-01	4.0E-02
		1.4E-03	i			1.4E-03	i	1		74-83-9	Bromomethane (Methyl bromide)	3.9E+00	nc	1.3E+01	nc	5.2E+00	nc	8.7E+00	nc	2.0E-01	1.0E-02
		5.0E-03	h			5.0E-03	r	0	0.10	2104-96-3	Bromophos	3.1E+02	nc	3.1E+03	nc	1.8E+01	nc	1.8E+02	nc		
		2.0E-02	i			2.0E-02	r	0	0.10	1689-84-5	Bromoxynil	1.2E+03	nc	1.2E+04	nc	7.3E+01	nc	7.3E+02	nc		
		2.0E-02	i			2.0E-02	r	0	0.10	1689-99-2	Bromoxynil octanoate	1.2E+03	nc	1.2E+04	nc	7.3E+01	nc	7.3E+02	nc		
9.8E-01	r			9.8E-01	i			1		106-99-0	**1,3-Butadiene**	6.5E-03	ca	1.4E-02	ca	6.9E-03	ca	1.1E-02	ca		
		1.0E-01	i			2.6E-03	n	0	0.10	71-36-3	**1-Butanol**	6.1E+03	nc	6.1E+04	nc	9.5E+00	nc	3.6E+03	nc	1.7E+01	9.0E-01
		5.0E-02	i			5.0E-02	r	0	0.10	2008-41-5	Butylate	3.1E+03	nc	3.1E+04	nc	1.8E+02	nc	1.8E+03	nc		
		4.00E-02	n			4.00E-02	r	1		104-51-8	**n-Butylbenzene**	2.4E+02	sat	2.4E+02	sat	1.5E+02	nc	2.4E+02	nc		
		4.00E-02	n			4.00E-02	r	1		135-9-88	**sec-Butylbenzene**	2.2E+02	sat	2.2E+02	sat	1.5E+02	nc	2.4E+02	nc		
		4.00E-02	n			4.00E-02	r	1		98-06-6	**tert-Butylbenzene**	3.9E+02	sat	3.9E+02	sat	1.5E+02	nc	2.4E+02	nc		
		2.0E-01	i			2.0E-01	r	0	0.10	85-68-7	Butyl benzyl phthalate	1.2E+04	nc	1.0E+05	max	7.3E+02	nc	7.3E+03	nc	9.3E+02	8.1E+02
		1.0E+00	i			1.0E+00	r	0	0.10	85-70-1	Butylphthalyl butylglycolate	6.1E+04	nc	1.0E+05	max	3.7E+03	nc	3.6E+04	nc		
2.5E-01	h	3.0E-04	h	2.5E-01	r	3.0E-04	r	0	0.10	75-60-5	**Cacodylic acid**	1.9E+00	ca**	6.9E+00	ca*	2.7E-02	ca*	2.7E-01	ca*		
		5.0E-04	i	6.3E+00	i			0	0.001	7440-43-9	Cadmium and compounds	3.7E+01	nc	4.5E+02	nc	1.1E-03	ca	1.8E+01	nc	8.0E+00	4.0E-01
		5.0E-01	i			5.0E-01	r	0	0.10	105-60-2	Caprolactam	3.1E+04	nc	1.0E+05	max	1.8E+03	nc	1.8E+04	nc		
8.6E-03	h	2.0E-03	i	8.6E-03	r	2.0E-03	r	0	0.10	2425-06-1	Captafol	5.7E+01	ca**	2.0E+02	ca**	7.8E-01	ca**	7.8E+00	ca**		
3.5E-03	h	1.3E-01	i	3.5E-03	r	1.3E-01	r	0	0.10	133-06-2	Captan	1.4E+02	ca*	4.9E+02	ca	1.9E+00	ca	1.9E+01	ca		
		1.0E-01	i			1.1E-01	r	0	0.10	63-25-2	Carbaryl	6.1E+03	nc	6.2E+04	nc	4.0E+02	nc	3.6E+03	nc		
2.0E-02	h			2.0E-02	r			0	0.10	86-74-8	Carbazole	2.4E+01	ca	8.6E+01	ca	3.4E-01	ca	3.4E+00	ca	6.0E-01	3.0E-02
		5.0E-03	i			5.0E-03	r	0	0.10	1563-66-2	Carbofuran	3.1E+02	nc	3.1E+03	nc	1.8E+01	nc	1.8E+02	nc		
		1.0E-01	i			2.0E-01	i	1		75-15-0	Carbon disulfide	3.6E+02	nc	7.2E+02	sat	7.3E+02	nc	1.0E+03	nc	3.2E+01	2.0E+00
1.3E-01	i	7.0E-04	i	5.3E-02	i	7.0E-04	r	1		56-23-5	Carbon tetrachloride	2.5E-01	ca**	5.5E-01	ca*	1.3E-01	ca*	1.7E-01	ca*	7.0E-02	3.0E-03
		1.0E-02	i			1.0E-02	r	0	0.10	55285-14-8	Carbosulfan	6.1E+02	nc	6.2E+03	nc	3.7E+01	nc	3.6E+02	nc		
		1.0E-01	i			1.0E-01	r	0	0.10	5234-68-4	Carboxin	6.1E+03	nc	6.2E+04	nc	3.7E+02	nc	3.6E+03	nc		
		1.5E-02	i			1.5E-02	r	0	0.10	133-90-4	Chloramben	9.2E+02	nc	9.2E+03	nc	5.5E+01	nc	5.5E+02	nc		
4.0E-01	h			4.0E-01	r			0	0.10	118-75-2	Chloranil	1.2E+00	ca	4.3E+00	ca	1.7E-02	ca	1.7E-01	ca		
3.5E-01	i	5.0E-04	i	3.5E-01	i	2.0E-04	i	0	0.04	12789-03-6	Chlordane	1.6E+00	ca*	6.5E+00	ca*	1.9E-02	ca*	1.9E-01	ca*	1.0E+01	5.0E-01
		2.0E-02	i			2.0E-02	r	0	0.10	90982-32-4	Chlorimuron-ethyl	1.2E+03	nc	1.2E+04	nc	7.3E+01	nc	7.3E+02	nc		
		1.0E-01	i			5.71E-05	n			7782-50-5	Chlorine					2.1E-01	nc				
						5.7E-05	i			10049-04-4	Chlorine dioxide					2.1E-01	nc				
		2.0E-03	h			2.0E-03	r	0	0.10	79-11-8	Chloroacetic acid	1.2E+02	nc	1.2E+03	nc	7.3E+00	nc	7.3E+01	nc		
		8.6E-06	r			8.6E-06	i	1		532-27-4	2-Chloroacetophenone	3.3E-02	nc	1.1E-01	nc	3.1E-02	nc	5.2E-02	nc		
		4.0E-03	i			4.0E-03	r	0	0.10	106-47-8	4-Chloroaniline	2.4E+02	nc	2.5E+03	nc	1.5E+01	nc	1.5E+02	nc	7.0E-01	3.0E-02
		2.0E-02	i			1.7E-02	n	1		108-90-7	Chlorobenzene	1.5E+02	nc	5.3E+02	nc	6.2E+01	nc	1.1E+02	nc	1.0E+00	7.0E-02

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+++=Non-Standard Method Applied (See Section 2.3 of the "Region 9 PRGs Table User's Guide") sat=Soil Saturation (See Section 4.5) max=Ceiling limit (See Section 2.1) DAF=Dilution Attenuation Factor (See Section 2.5) CAS=Chemical Abstract Services

TOXICITY INFORMATION										CONTAMINANT	PRELIMINARY REMEDIAL GOALS (PRGs) "Direct Contact Exposure Pathways"								SOIL SCREENING LEVELS "Migration to Ground Water"	
SFo 1/(mg/kg-d)		RfDo (mg/kg-d)		SFi 1/(mg/kg-d)		RfDi (mg/kg-d)		VOC	skin abs. soils	CAS No.		Residential Soil (mg/kg)		Industrial Soil (mg/kg)		Ambient Air (ug/m^3)		Tap Water (ug/l)		DAF 20 (mg/kg)	DAF 1 (mg/kg)
2.7E-01	h	2.0E-02	i	2.7E-01	h	2.0E-02	r	0	0.10	510-15-6	Chlorobenzilate	1.8E+00	ca	6.4E+00	ca	2.5E-02	ca	2.5E-01	ca		
		2.0E-01	h			2.0E-01	r	0	0.10	74-11-3	p-Chlorobenzoic acid	1.2E+04	nc	1.0E+05	max	7.3E+02	nc	7.3E+03	nc		
		2.0E-02	h			2.0E-02	r	0	0.10	98-56-6	4-Chlorobenzotrifluoride	1.2E+03	nc	1.2E+04	nc	7.3E+01	nc	7.3E+02	nc		
		2.0E-02	h			2.0E-03	h	1		126-99-8	2-Chloro-1,3-butadiene	3.6E+00	nc	1.2E+01	nc	7.3E+00	nc	1.4E+01	nc		
		4.0E-01	h			4.0E-01	r	1		109-69-3	1-Chlorobutane	4.8E+02	sat	4.8E+02	sat	1.5E+03	nc	2.4E+03	nc		
		1.4E+01	r			1.4E+01	i	1		75-68-3	1-Chloro-1,1-difluoroethane (HCFC-142b)	3.4E+02	sat	3.4E+02	sat	5.2E+04	nc	8.7E+04	nc		
		1.4E+01	r			1.4E+01	i	1		75-45-6	Chlorodifluoromethane	3.4E+02	sat	3.4E+02	sat	5.1E+04	nc	8.5E+04	nc		
2.9E-03	n	4.0E-01	n	2.9E-03	r	2.9E+00	i	1		75-00-3	Chloroethane	3.0E+00	ca	6.5E+00	ca	2.3E+00	ca	4.6E+00	ca		
		1.0E-02	i			8.6E-04	n	1		67-66-3	**Chloroform**	3.6E+00	ca/nc	1.2E+01	ca/nc	3.1E+00	ca/nc	6.2E+00	ca/nc	6.0E-01	3.0E-02
3.1E-02				1.9E-02				1			**Chloroform "CAL-Modified PRG"**	9.4E-01	ca	2.0E+00	ca	3.5E-01	ca	5.3E-01	ca		
1.3E-02	h			6.3E-03	h	8.6E-02	n	1		74-87-3	Chloromethane	1.2E+00	ca	2.6E+00	ca	1.1E+00	ca	1.5E+00	ca		
5.8E-01	h			5.8E-01	r			0	0.10	95-69-2	4-Chloro-2-methylaniline	8.4E-01	ca	3.0E+00	ca	1.2E-02	ca	1.2E-01	ca		
4.6E-01	h			4.6E-01	r			0	0.10	3165-93-3	4-Chloro-2-methylaniline hydrochloride	1.1E+00	ca	3.7E+00	ca	1.5E-02	ca	1.5E-01	ca		
		8.0E-02	i			8.0E-02	r	1		91-58-7	beta-Chloronaphthalene	4.9E+03	nc	2.3E+04	nc	2.9E+02	nc	4.9E+02	nc		
9.7E-03	h	1.0E-03	h	9.7E-03	r	2.0E-05	h	1		88-73-3	**o-Chloronitrobenzene**	1.4E+00	nc**	4.5E+00	nc**	7.3E-02	nc**	1.5E-01	nc**		
6.7E-03	h	1.0E-03	h	6.7E-03	r	1.7E-04	h	1		100-00-5	**p-Chloronitrobenzene**	1.0E+01	nc**	3.7E+01	nc**	6.2E-01	nc**	1.2E+00	nc**		
		5.0E-03	i			5.0E-03	r	1		95-57-8	2-Chlorophenol	6.3E+01	nc	2.4E+02	nc	1.8E+01	nc	3.0E+01	nc	4.0E+00	2.0E-01
		2.9E-02	r			2.9E-02	h	1		75-29-6	2-Chloropropane	1.7E+02	nc	5.9E+02	nc	1.0E+02	nc	1.7E+02	nc		
1.1E-02	h	1.5E-02	i	1.1E-02	r	1.5E-02	r	0	0.10	1897-45-6	Chlorothalonil	4.4E+01	ca*	1.6E+02	ca*	6.1E-01	ca*	6.1E+00	ca*		
		2.0E-02	i			2.0E-02	r	1		95-49-8	o-Chlorotoluene	1.6E+02	nc	5.6E+02	nc	7.3E+01	nc	1.2E+02	nc		
		2.0E-01	i			2.0E-01	r	0	0.10	101-21-3	Chlorpropham	1.2E+04	nc	1.0E+05	max	7.3E+02	nc	7.3E+03	nc		
		3.0E-03	i			3.0E-03	r	0	0.10	2921-88-2	Chlorpyrifos	1.8E+02	nc	1.8E+03	nc	1.1E+01	nc	1.1E+02	nc		
		1.0E-02	h			1.0E-02	r	0	0.10	5598-13-0	Chlorpyrifos-methyl	6.1E+02	nc	6.2E+03	nc	3.7E+01	nc	3.6E+02	nc		
		5.0E-02	i			5.0E-02	r	0	0.10	64902-72-3	Chlorsulfuron	3.1E+03	nc	3.1E+04	nc	1.8E+02	nc	1.8E+03	nc		
		8.0E-04	h			8.0E-04	r	0	0.10	60238-56-4	Chlorthiophos	4.9E+01	nc	4.9E+02	nc	2.9E+00	nc	2.9E+01	nc		
				4.2E+01	i			0			Total Chromium (1:6 ratio Cr VI:Cr III)+++	2.1E+02	ca	4.5E+02	ca	1.6E-04	ca			3.8E+01	2.0E+00
		1.5E+00	i							16065-83-1	Chromium III	1.0E+05	max	1.0E+05	max	0.0E+00		5.5E+04	nc		
		3.0E-03	i	2.9E+02	i	2.2E-06	i	0		18540-29-9	Chromium VI+++	3.0E+01	ca**	6.4E+01	ca	2.3E-05	ca	1.1E+02	nc	3.8E+01	2.0E+00
		2.00E-02	n	9.8E+00	n	5.7E-06	n			7440-48-4	**Cobalt**	9.0E+02	ca**	1.9E+03	ca*	6.9E-04	ca*	7.3E+02	nc		
				2.2E+00	i			0		8007-45-2	Coke Oven Emissions					3.1E-03	ca				
		4.00E-02	h					0		7440-50-8	Copper and compounds	3.1E+03	nc	4.1E+04	nc			1.5E+03	nc		
1.9E+00	h			1.9E+00	r			1		123-73-9	Crotonaldehyde	5.3E-03	ca	1.1E-02	ca	3.5E-03	ca	5.9E-03	ca		
		1.0E-01	i			1.1E-01	i	1		98-82-8	Cumene (isopropylbenzene)	5.7E+02	nc	2.0E+03	nc	4.0E+02	nc	6.6E+02	nc		
8.4E-01	h	2.0E-03	h	8.4E-01	r	2.0E-03	r	0	0.10	21725-46-2	Cyanazine	5.8E-01	ca	2.1E+00	ca	8.0E-03	ca	8.0E-02	ca		
		2.0E-02	i					0	0.10	57-12-5	Cyanide (free)	1.2E+03	nc	1.2E+04	nc			7.3E+02	nc		
		2.0E-02	i			8.6E-04	i	1		74-90-8	Cyanide (hydrogen)	1.1E+01	nc	3.5E+01	nc	3.1E+00	nc	6.2E+00	nc		

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TOXICITY INFORMATION									CONTAMINANT	PRELIMINARY REMEDIAL GOALS (PRGs) "Direct Contact Exposure Pathways"								SOIL SCREENING LEVELS "Migration to Ground Water"	
SFo 1/(mg/kg-d)		RfDo (mg/kg-d)		SFi 1/(mg/kg-d)		RfDi (mg/kg-d)		V O C / skin abs. soils / CAS No.		Residential Soil (mg/kg)		Industrial Soil (mg/kg)		Ambient Air (ug/m^3)		Tap Water (ug/l)		DAF 20 (mg/kg)	DAF 1 (mg/kg)
		4.0E-02	i			4.0E-02	r	1 / / 460-19-5	Cyanogen	1.3E+02	nc	4.3E+02	nc	1.5E+02	nc	2.4E+02	nc		
		9.0E-02	i			9.0E-02	r	1 / / 506-68-3	Cyanogen bromide	2.9E+02	nc	9.7E+02	nc	3.3E+02	nc	5.5E+02	nc		
		5.0E-02	i			5.0E-02	r	1 / / 506-77-4	Cyanogen chloride	1.6E+02	nc	5.4E+02	nc	1.8E+02	nc	3.0E+02	nc		
		5.7E+00	r			5.7E+00	n	1 / / 110-82-7	Cyclohexane	1.4E+02	sat	1.4E+02	sat	2.1E+04	nc	3.5E+04	nc		
		5.0E+00	i			5.0E+00	r	0 / 0.10 / 108-94-1	Cyclohexanone	1.0E+05	max	1.0E+05	max	1.8E+04	nc	1.8E+05	nc		
		2.0E-01	i			2.0E-01	r	0 / 0.10 / 108-91-8	Cyclohexylamine	1.2E+04	nc	1.0E+05	max	7.3E+02	nc	7.3E+03	nc		
		5.0E-03	i			5.0E-03	r	0 / 0.10 / 68085-85-8	Cyhalothrin/Karate	3.1E+02	nc	3.1E+03	nc	1.8E+01	nc	1.8E+02	nc		
		1.0E-02	i			1.0E-02	r	0 / 0.10 / 52315-07-8	Cypermethrin	6.1E+02	nc	6.2E+03	nc	3.7E+01	nc	3.6E+02	nc		
		7.5E-03	i			7.5E-03	r	0 / 0.10 / 66215-27-8	Cyromazine	4.6E+02	nc	4.6E+03	nc	2.7E+01	nc	2.7E+02	nc		
		1.0E-02	i			1.0E-02	r	0 / 0.10 / 1861-32-1	Dacthal	6.1E+02	nc	6.2E+03	nc	3.7E+01	nc	3.6E+02	nc		
		3.0E-02	i			3.0E-02	r	0 / 0.10 / 75-99-0	Dalapon	1.8E+03	nc	1.8E+04	nc	1.1E+02	nc	1.1E+03	nc		
		2.5E-02	i			2.5E-02	r	0 / 0.10 / 39515-41-8	Danitol	1.5E+03	nc	1.5E+04	nc	9.1E+01	nc	9.1E+02	nc		
2.4E-01	i			2.4E-01	r			0 / 0.03 / 72-54-8	DDD	2.4E+00	ca	1.0E+01	ca	2.8E-02	ca	2.8E-01	ca	1.6E+01	8.0E-01
3.4E-01	i			3.4E-01	r			0 / 0.03 / 72-55-9	DDE	1.7E+00	ca	7.0E+00	ca	2.0E-02	ca	2.0E-01	ca	5.4E+01	3.0E+00
3.4E-01	i	5.0E-04	i	3.4E-01	i	5.0E-04	r	0 / 0.03 / 50-29-3	DDT	1.7E+00	ca*	7.0E+00	ca*	2.0E-02	ca*	2.0E-01	ca*	3.2E+01	2.0E+00
		1.0E-02	i			1.0E-02	r	0 / 0.10 / 1163-19-5	Decabromodiphenyl ether	6.1E+02	nc	6.2E+03	nc	3.7E+01	nc	3.6E+02	nc		
		4.0E-05	i			4.0E-05	r	0 / 0.10 / 8065-48-3	Demeton	2.4E+00	nc	2.5E+01	nc	1.5E-01	nc	1.5E+00	nc		
6.1E-02	h			6.1E-02	r			0 / 0.10 / 2303-16-4	Diallate	8.0E+00	ca	2.8E+01	ca	1.1E-01	ca	1.1E+00	ca		
		9.0E-04	h			9.0E-04	r	0 / 0.10 / 333-41-5	Diazinon	5.5E+01	nc	5.5E+02	nc	3.3E+00	nc	3.3E+01	nc		
		4.0E-03	n			4.0E-03	r	1 / / 132-64-9	Dibenzofuran	2.9E+02	nc	3.1E+03	nc	1.5E+01	nc	2.4E+01	nc		
		1.0E-02	i			1.0E-02	r	0 / 0.10 / 106-37-6	1,4-Dibromobenzene	6.1E+02	nc	6.2E+03	nc	3.7E+01	nc	3.6E+02	nc		
8.4E-02	i	2.0E-02	i	8.4E-02	r	2.0E-02	r	1 / / 124-48-1	Dibromochloromethane	1.1E+00	ca	2.6E+00	ca	8.0E-02	ca	1.3E-01	ca	4.0E-01	2.0E-02
1.4E+00	h	5.7E-05	r	2.4E-03	x	5.7E-05	i	1 / / 96-12-8	1,2-Dibromo-3-chloropropane	4.5E-01	ca**	2.0E+00	ca**	2.1E-01	nc	4.8E-02	ca**		
7.0E+00				7.0E+00				1 / / 96-12-8	**"CAL-Modified PRG"**	1.9E-02	ca	4.6E-02	ca	9.6E-04	ca	1.6E-03	ca		
8.5E+01	i	5.7E-05	r	7.7E-01	i	5.7E-05	h	1 / / 106-93-4	1,2-Dibromoethane	6.9E-03	ca	2.8E-02	ca*	8.7E-03	ca*	7.6E-04	ca		
		1.0E-01	i			1.0E-01	r	0 / 0.10 / 84-74-2	Dibutyl phthalate	6.1E+03	nc	6.2E+04	nc	3.7E+02	nc	3.6E+03	nc	2.3E+03	2.7E+02
		3.0E-02	i			3.0E-02	r	0 / 0.10 / 1918-00-9	Dicamba	1.8E+03	nc	1.8E+04	nc	1.1E+02	nc	1.1E+03	nc		
		9.0E-02	i			5.7E-02	h	1 / / 95-50-1	1,2-Dichlorobenzene	3.7E+02	sat	3.7E+02	sat	2.1E+02	nc	3.7E+02	nc	1.7E+01	9.0E-01
		9.00E-04	n			9.00E-04	r	1 / / 541-73-1	1,3-Dichlorobenzene	1.6E+01	nc	6.3E+01	nc	3.3E+00	nc	5.5E+00	nc		
2.4E-02	h	3.00E-02	n	2.2E-02	n	3.00E-02	i	1 / / 106-46-7	1,4-Dichlorobenzene	3.4E+00	ca	7.9E+00	ca	3.1E-01	ca	5.0E-01	ca	2.0E+00	1.0E-01
4.5E-01	i			4.5E-01	r			0 / 0.10 / 91-94-1	3,3-Dichlorobenzidine	1.1E+00	ca	3.8E+00	ca	1.5E-02	ca	1.5E-01	ca	7.0E-03	3.0E-04
		3.00E-02	n			3.00E-02	r	0 / 0.10 / 90-98-2	4,4'-Dichlorobenzophenone	1.8E+03	nc	1.8E+04	nc	1.1E+02	nc	1.1E+03	nc		
9.3E+00	r			9.3E+00	h			1 / / 764-41-0	1,4-Dichloro-2-butene	7.9E-03	ca	1.8E-02	ca	7.2E-04	ca	1.2E-03	ca		
		2.0E-01	i			5.7E-02	h	1 / / 75-71-8	Dichlorodifluoromethane	9.4E+01	nc	3.1E+02	nc	2.1E+02	nc	3.9E+02	nc		
		1.0E-01	h			1.4E-01	h	1 / / 75-34-3	1,1-Dichloroethane	5.1E+02	nc	1.7E+03	nc	5.2E+02	nc	8.1E+02	nc	2.3E+01	1.0E+00
5.7E-03				5.7E-03				1	"CAL-Modified PRG"	2.8E+00	ca	6.0E+00	ca	1.2E+00	ca	2.0E+00	ca		

Key : SFo,i=Cancer Slope Factor oral, inhalation RfDo,i=Reference Dose oral, inhalation i=IRIS h=HEAST n=NCEA x=Withdrawn o=Other EPA Source r=Route-extrapolation ca=Cancer PRG nc=Noncancer PRG ca* (where: nc < 100X ca) ca**(where: nc < 10X ca)
+++=Non-Standard Method Applied (See Section 2.3 of the "Region 9 PRGs Table User's Guide") sat=Soil Saturation (See Section 4.5) max=Ceiling limit (See Section 2.1) DAF=Dilution Attenuation Factor (See Section 2.5) CAS=Chemical Abstract Services

TOXICITY INFORMATION										CONTAMINANT	PRELIMINARY REMEDIAL GOALS (PRGs) "Direct Contact Exposure Pathways"								SOIL SCREENING LEVELS "Migration to Ground Water"	
SFo 1/(mg/kg-d)		RfDo (mg/kg-d)		SFi 1/(mg/kg-d)		RfDi (mg/kg-d)		VOC	skin abs. soils	CAS No.		Residential Soil (mg/kg)		Industrial Soil (mg/kg)		Ambient Air (ug/m^3)		Tap Water (ug/l)		DAF 20 (mg/kg)	DAF 1 (mg/kg)
9.1E-02	i	3.0E-02	n	9.1E-02	i	1.4E-03	n	1		107-06-2	1,2-Dichloroethane (EDC)	2.8E-01	ca*	6.0E-01	ca*	7.4E-02	ca*	1.2E-01	ca*	2.0E-02	1.0E-03
		5.0E-02	i			5.7E-02	i	1		75-35-4	**1,1-Dichloroethylene**	1.2E+02	nc	4.1E+02	nc	2.1E+02	nc	3.4E+02	nc	6.0E-02	3.0E-03
		1.0E-02	h			1.0E-02	r	1		156-59-2	1,2-Dichloroethylene (cis)	4.3E+01	nc	1.5E+02	nc	3.7E+01	nc	6.1E+01	nc	4.0E-01	2.0E-02
		2.0E-02	i			2.0E-02	r	1		156-60-5	1,2-Dichloroethylene (trans)	6.9E+01	nc	2.3E+02	nc	7.3E+01	nc	1.2E+02	nc	7.0E-01	3.0E-02
		3.0E-03	i			3.0E-03	r	0	0.10	120-83-2	2,4-Dichlorophenol	1.8E+02	nc	1.8E+03	nc	1.1E+01	nc	1.1E+02	nc	1.0E+00	5.0E-02
		8.0E-03	i			8.0E-03	r	0	0.10	94-82-6	4-(2,4-Dichlorophenoxy)butyric Acid (2,4-DB)	4.9E+02	nc	4.9E+03	nc	2.9E+01	nc	2.9E+02	nc		
		1.0E-02	i			1.0E-02	r	0	0.05	94-75-7	2,4-Dichlorophenoxyacetic Acid (2,4-D)	6.9E+02	nc	7.7E+03	nc	3.7E+01	nc	3.6E+02	nc		
6.8E-02	h	1.1E-03	r	6.8E-02	r	1.1E-03	i	1		78-87-5	1,2-Dichloropropane	3.4E-01	ca*	7.4E-01	ca*	9.9E-02	ca*	1.6E-01	ca*	3.0E-02	1.0E-03
1.0E-01	i	3.00E-02	i	1.4E-02	i	5.7E-03	i	1		542-75-6	1,3-Dichloropropene	7.8E-01	ca	1.8E+00	ca	4.8E-01	ca	4.0E-01	ca	4.0E-03	2.0E-04
		3.0E-03	i			3.0E-03	r	0	0.10	616-23-9	2,3-Dichloropropanol	1.8E+02	nc	1.8E+03	nc	1.1E+01	nc	1.1E+02	nc		
2.9E-01	i	5.0E-04	i	2.9E-01	r	1.4E-04	i	0	0.10	62-73-7	Dichlorvos	1.7E+00	ca*	5.9E+00	ca*	2.3E-02	ca*	2.3E-01	ca*		
4.4E-01	x			4.4E-01	r			0	0.10	115-32-2	Dicofol	1.1E+00	ca	3.9E+00	ca	1.5E-02	ca	1.5E-01	ca		
		3.0E-02	h			5.7E-05	x	1		77-73-6	Dicyclopentadiene	5.4E-01	nc	1.8E+00	nc	2.1E-01	nc	4.2E-01	nc		
1.6E+01	i	5.0E-05	i	1.6E+01	i	5.0E-05	r	0	0.10	60-57-1	Dieldrin	3.0E-02	ca	1.1E-01	ca	4.2E-04	ca	4.2E-03	ca	4.0E-03	2.0E-04
		1.0E-02	h			5.7E-03	h	0	0.10	112-34-5	**Diethylene glycol, monobutyl ether**	6.1E+02	nc	6.2E+03	nc	2.1E+01	nc	3.6E+02	nc		
		6.0E-02	h			8.6E-04	h	0	0.10	111-90-0	**Diethylene glycol, monomethyl ether**	3.7E+03	nc	3.7E+04	nc	3.1E+00	nc	2.2E+03	nc		
		4.0E-03	h			4.0E-03	r	0	0.10	617-84-5	**Diethylformamide**	2.4E+02	nc	2.5E+03	nc	1.5E+01	nc	1.5E+02	nc		
1.2E-03	i	6.0E-01	i	1.2E-03	r	6.0E-01	r	0	0.10	103-23-1	Di(2-ethylhexyl)adipate	4.1E+02	ca	1.4E+03	ca	5.6E+00	ca	5.6E+01	ca		
		8.0E-01	i			8.0E-01	r	0	0.10	84-66-2	Diethyl phthalate	4.9E+04	nc	1.0E+05	max	2.9E+03	nc	2.9E+04	nc		
4.7E+03	h			4.7E+03	r			0	0.10	56-53-1	Diethylstilbestrol	1.0E-04	ca	3.7E-04	ca	1.4E-06	ca	1.4E-05	ca		
		8.0E-02	i			8.0E-02	r	0	0.10	43222-48-6	Difenzoquat (Avenge)	4.9E+03	nc	4.9E+04	nc	2.9E+02	nc	2.9E+03	nc		
		2.0E-02	i			2.0E-02	r	0	0.10	35367-38-5	Diflubenzuron	1.2E+03	nc	1.2E+04	nc	7.3E+01	nc	7.3E+02	nc		
		1.1E+01	r			1.1E+01	i	1		75-37-6	1,1-Difluoroethane					4.2E+04	nc	6.9E+04	nc		
		2.00E-02	n			2.00E-02	r		0.10	28553-12-0	Diisononyl phthalate	1.2E+03	nc	1.2E+04	nc	7.3E+01	nc	7.3E+02	nc		
		8.0E-02	i			8.0E-02	r	0	0.10	1445-75-6	Diisopropyl methylphosphonate	4.9E+03	nc	4.9E+04	nc	2.9E+02	nc	2.9E+03	nc		
		2.0E-02	i			2.0E-02	r	0	0.10	55290-64-7	Dimethipin	1.2E+03	nc	1.2E+04	nc	7.3E+01	nc	7.3E+02	nc		
		2.0E-04	i			2.0E-04	r	0	0.10	60-51-5	Dimethoate	1.2E+01	nc	1.2E+02	nc	7.3E-01	nc	7.3E+00	nc		
1.4E-02	h			1.4E-02	r			0	0.10	119-90-4	3,3'-Dimethoxybenzidine	3.5E+01	ca	1.2E+02	ca	4.8E-01	ca	4.8E+00	ca		
		5.7E-06	r			5.7E-06	x	1		124-40-3	Dimethylamine	6.7E-02	nc	2.5E-01	nc	2.1E-02	nc	3.5E-02	nc		
		2.0E-03	i			2.0E-03	r	0	0.10	121-69-7	N-N-Dimethylaniline	1.2E+02	nc	1.2E+03	nc	7.3E+00	nc	7.3E+01	nc		
7.5E-01	h			7.5E-01	r			0	0.10	95-68-1	2,4-Dimethylaniline	6.5E-01	ca	2.3E+00	ca	9.0E-03	ca	9.0E-02	ca		
5.8E-01	h			5.8E-01	r			0	0.10	21436-96-4	2,4-Dimethylaniline hydrochloride	8.4E-01	ca	3.0E+00	ca	1.2E-02	ca	1.2E-01	ca		
9.2E+00	h			9.2E+00	r			0	0.10	119-93-7	3,3'-Dimethylbenzidine	5.3E-02	ca	1.9E-01	ca	7.3E-04	ca	7.3E-03	ca		
		1.0E-01	h			8.6E-03	i	0	0.10	68-12-2	N,N-Dimethylformamide	6.1E+03	nc	6.2E+04	nc	3.1E+01	nc	3.6E+03	nc		
		1.0E-03	n			1.0E-03	r	0	0.10	122-09-8	Dimethylphenethylamine	6.1E+01	nc	6.2E+02	nc	3.7E+00	nc	3.6E+01	nc		
		2.0E-02	i			2.0E-02	r	0	0.10	105-67-9	2,4-Dimethylphenol	1.2E+03	nc	1.2E+04	nc	7.3E+01	nc	7.3E+02	nc	9.0E+00	4.0E-01

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TOXICITY INFORMATION									CONTAMINANT	PRELIMINARY REMEDIAL GOALS (PRGs) "Direct Contact Exposure Pathways"								SOIL SCREENING LEVELS "Migration to Ground Water"	
SFo 1/(mg/kg-d)		RfDo (mg/kg-d)		SFi 1/(mg/kg-d)		RfDi (mg/kg-d)		V O C / skin abs. soils / CAS No.		Residential Soil (mg/kg)		Industrial Soil (mg/kg)		Ambient Air (ug/m^3)		Tap Water (ug/l)		DAF 20 (mg/kg)	DAF 1 (mg/kg)
		6.0E-04	i			6.0E-04	r	0 / 0.10 / 576-26-1	2,6-Dimethylphenol	3.7E+01	nc	3.7E+02	nc	2.2E+00	nc	2.2E+01	nc		
		1.0E-03	i			1.0E-03	r	0 / 0.10 / 95-65-8	3,4-Dimethylphenol	6.1E+01	nc	6.2E+02	nc	3.7E+00	nc	3.6E+01	nc		
		1.0E+01	h			1.0E+01	r	0 / 0.10 / 131-11-3	Dimethyl phthalate	1.0E+05	max	1.0E+05	max	3.7E+04	nc	3.6E+05	nc		
		1.0E-01	i			1.0E-01	r	0 / 0.10 / 120-61-6	Dimethyl terephthalate	6.1E+03	nc	6.2E+04	nc	3.7E+02	nc	3.6E+03	nc		
		2.0E-03	i			2.0E-03	r	0 / 0.10 / 131-89-5	4,6-Dinitro-o-cyclohexyl phenol	1.2E+02	nc	1.2E+03	nc	7.3E+00	nc	7.3E+01	nc		
		1.0E-04	h			1.0E-04	r	0 / 0.10 / 528-29-0	**1,2-Dinitrobenzene**	6.1E+00	nc	6.2E+01	nc	3.7E-01	nc	3.6E+00	nc		
		1.0E-04	i			1.0E-04	r	0 / 0.10 / 99-65-0	1,3-Dinitrobenzene	6.1E+00	nc	6.2E+01	nc	3.7E-01	nc	3.6E+00	nc		
		1.0E-04	h			1.0E-04	r	0 / 0.10 / 100-25-4	**1,4-Dinitrobenzene**	6.1E+00	nc	6.2E+01	nc	3.7E-01	nc	3.6E+00	nc		
		2.0E-03	i			2.0E-03	r	0 / 0.10 / 51-28-5	2,4-Dinitrophenol	1.2E+02	nc	1.2E+03	nc	7.3E+00	nc	7.3E+01	nc	3.0E-01	1.0E-02
6.8E-01	i			6.8E-01	r			0 / 0.10 / 25321-14-6	Dinitrotoluene mixture	7.2E-01	ca	2.5E+00	ca	9.9E-03	ca	9.9E-02	ca	8.0E-04	4.0E-05
		2.0E-03	i			2.0E-03	r	0 / 0.10 / 121-14-2	2,4-Dinitrotoluene (see DNT mixture for "ca")	1.2E+02	nc	1.2E+03	nc	7.3E+00	nc	7.3E+01	nc	8.0E-04	4.0E-05
		1.0E-03	h			1.0E-03	r	0 / 0.10 / 606-20-2	2,6-Dinitrotoluene (see DNT mixture for "ca")	6.1E+01	nc	6.2E+02	nc	3.7E+00	nc	3.6E+01	nc	7.0E-04	3.0E-05
		1.0E-03	i			1.0E-03	r	0 / 0.10 / 88-85-7	Dinoseb	6.1E+01	nc	6.2E+02	nc	3.7E+00	nc	3.6E+01	nc		
		4.0E-02	h			4.0E-02	r	0 / 0.10 / 117-84-0	**di-n-Octyl phthalate**	2.4E+03	nc	2.5E+04	nc	1.5E+02	nc	1.5E+03	nc	1.0E+04	1.0E+04
1.1E-02	i			1.1E-02	r			0 / 0.10 / 123-91-1	1,4-Dioxane	4.4E+01	ca	1.6E+02	ca	6.1E-01	ca	6.1E+00	ca		
1.5E+05	h			1.5E+05	h			0 / 0.03 / 1746-01-6	Dioxin (2,3,7,8-TCDD)	3.9E-06	ca	1.6E-05	ca	4.5E-08	ca	4.5E-07	ca		
		3.0E-02	i			3.0E-02	r	0 / 0.10 / 957-51-7	Diphenamid	1.8E+03	nc	1.8E+04	nc	1.1E+02	nc	1.1E+03	nc		
		2.5E-02	i			2.5E-02	r	0 / 0.10 / 122-39-4	Diphenylamine	1.5E+03	nc	1.5E+04	nc	9.1E+01	nc	9.1E+02	nc		
		3.00E-04	n			3.00E-04	r	/ 0.10 / 74-31-7	N,N-Diphenyl-1,4 benzenediamine (DPPD)	1.8E+01	nc	1.8E+02	nc	1.1E+00	nc	1.1E+01	nc		
8.0E-01	i			7.7E-01	i			0 / 0.10 / 122-66-7	1,2-Diphenylhydrazine	6.1E-01	ca	2.2E+00	ca	8.7E-03	ca	8.4E-02	ca		
		3.0E-03	n			3.0E-03	r	0 / 0.10 / 127-63-9	**Diphenyl sulfone**	1.8E+02	nc	1.8E+03	nc	1.1E+01	nc	1.1E+02	nc		
		2.2E-03	i			2.2E-03	r	0 / 0.10 / 85-00-7	Diquat	1.3E+02	nc	1.4E+03	nc	8.0E+00	nc	8.0E+01	nc		
8.6E+00	h			8.6E+00	r			0 / 0.10 / 1937-37-7	Direct black 38	5.7E-02	ca	2.0E-01	ca	7.8E-04	ca	7.8E-03	ca		
8.1E+00	h			8.1E+00	r			0 / 0.10 / 2602-46-2	Direct blue 6	6.0E-02	ca	2.1E-01	ca	8.3E-04	ca	8.3E-03	ca		
9.3E+00	h			9.3E+00	r			0 / 0.10 / 16071-86-6	Direct brown 95	5.2E-02	ca	1.9E-01	ca	7.2E-04	ca	7.2E-03	ca		
		4.0E-05	i			4.0E-05	r	0 / 0.10 / 298-04-4	Disulfoton	2.4E+00	nc	2.5E+01	nc	1.5E-01	nc	1.5E+00	nc		
		1.0E-02	i			1.0E-02	r	0 / 0.10 / 505-29-3	1,4-Dithiane	6.1E+02	nc	6.2E+03	nc	3.7E+01	nc	3.6E+02	nc		
		2.0E-03	i			2.0E-03	r	0 / 0.10 / 330-54-1	Diuron	1.2E+02	nc	1.2E+03	nc	7.3E+00	nc	7.3E+01	nc		
		4.0E-03	i			4.0E-03	r	0 / 0.10 / 2439-10-3	Dodine	2.4E+02	nc	2.5E+03	nc	1.5E+01	nc	1.5E+02	nc		
		2.0E-01	n					/ / 7429-91-6	Dysprosium	1.6E+04	nc	1.0E+05	max			7.3E+03	nc		
		6.0E-03	i			6.0E-03	r	0 / 0.10 / 115-29-7	Endosulfan	3.7E+02	nc	3.7E+03	nc	2.2E+01	nc	2.2E+02	nc	1.8E+01	9.0E-01
		2.0E-02	i			2.0E-02	r	0 / 0.10 / 145-73-3	Endothall	1.2E+03	nc	1.2E+04	nc	7.3E+01	nc	7.3E+02	nc		
		3.0E-04	i			3.0E-04	r	0 / 0.10 / 72-20-8	Endrin	1.8E+01	nc	1.8E+02	nc	1.1E+00	nc	1.1E+01	nc	1.0E+00	5.0E-02
9.9E-03	i	2.0E-03	h	4.2E-03	h	2.9E-04	i	1 / / 106-89-8	Epichlorohydrin	7.6E+00	nc	2.6E+01	nc	1.0E+00	nc	2.0E+00	nc		
		5.7E-03	r			5.7E-03	i	0 / 0.10 / 106-88-7	1,2-Epoxybutane	3.5E+02	nc	3.5E+03	nc	2.1E+01	nc	2.1E+02	nc		
		2.5E-02	i			2.5E-02	r	0 / 0.10 / 759-94-4	EPTC (S-Ethyl dipropylthiocarbamate)	1.5E+03	nc	1.5E+04	nc	9.1E+01	nc	9.1E+02	nc		

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SFo 1/(mg/kg-d)		RfDo (mg/kg-d)		SFi 1/(mg/kg-d)		RfDi (mg/kg-d)		VOC skin abs. soils	CAS No.		Residential Soil (mg/kg)		Industrial Soil (mg/kg)		Ambient Air (ug/m^3)		Tap Water (ug/l)		DAF 20 (mg/kg)	DAF 1 (mg/kg)
		5.0E-03	i			5.0E-03	r	0 0.10	16672-87-0	Ethephon (2-chloroethyl phosphonic acid)	3.1E+02	nc	3.1E+03	nc	1.8E+01	nc	1.8E+02	nc		
		5.0E-04	i			5.0E-04	r	0 0.10	563-12-2	Ethion	3.1E+01	nc	3.1E+02	nc	1.8E+00	nc	1.8E+01	nc		
		4.0E-01	h			5.7E-02	i	0 0.10	110-80-5	2-Ethoxyethanol	2.4E+04	nc	1.0E+05	max	2.1E+02	nc	1.5E+04	nc		
		3.0E-01	h			3.0E-01	r	0 0.10	111-15-9	2-Ethoxyethanol acetate	1.8E+04	nc	1.0E+05	max	1.1E+03	nc	1.1E+04	nc		
		9.0E-01	i			9.0E-01	r	1	141-78-6	Ethyl acetate	1.9E+04	nc	3.7E+04	sat	3.3E+03	nc	5.5E+03	nc		
4.8E-02	h			4.8E-02	r			1	140-88-5	Ethyl acrylate	2.1E-01	ca	4.5E-01	ca	1.4E-01	ca	2.3E-01	ca		
3.85E-03	r	1.0E-01	i	3.85E-03	n	2.9E-01	i	1	100-41-4	**Ethylbenzene**	8.9E+00	ca	2.0E+01	ca	1.7E+00	ca	2.9E+00	ca	1.3E+01	7.0E-01
2.9E-03	n	4.0E-01	n	2.9E-03	r	2.9E+00	i	1	75-00-3	Ethyl chloride	3.0E+00	ca	6.5E+00	ca	2.3E+00	ca	4.6E+00	ca		
		3.0E-01	h			3.0E-01	r	0 0.10	109-78-4	Ethylene cyanohydrin	1.8E+04	nc	1.0E+05	max	1.1E+03	nc	1.1E+04	nc		
		2.0E-02	h			2.0E-02	r	0 0.10	107-15-3	Ethylene diamine	1.2E+03	nc	1.2E+04	nc	7.3E+01	nc	7.3E+02	nc		
		2.0E+00	i			2.0E+00	r	0 0.10	107-21-1	Ethylene glycol	1.0E+05	max	1.0E+05	max	7.3E+03	nc	7.3E+04	nc		
		5.0E-01	i			3.7E+00	i	0 0.10	111-76-2	Ethylene glycol, monobutyl ether	3.1E+04	nc	1.0E+05	max	1.4E+04	nc	1.8E+04	nc		
1.0E+00	h			3.5E-01	h			1	75-21-8	Ethylene oxide	1.4E-01	ca	3.4E-01	ca	1.9E-02	ca	2.4E-02	ca		
1.1E-01	h	8.0E-05	i	1.1E-01	r	8.0E-05	r	0 0.10	96-45-7	Ethylene thiourea (ETU)	4.4E+00	ca**	1.6E+01	ca**	6.1E-02	ca**	6.1E-01	ca**		
		2.0E-01	i			2.0E-01	r	1	60-29-7	Ethyl ether	1.8E+03	sat	1.8E+03	sat	7.3E+02	nc	1.2E+03	nc		
		9.0E-02	h			9.0E-02	r	1	97-63-2	Ethyl methacrylate	1.4E+02	sat	1.4E+02	sat	3.3E+02	nc	5.5E+02	nc		
		1.0E-05	i			1.0E-05	r	0 0.10	2104-64-5	Ethyl p-nitrophenyl phenylphosphorothioate	6.1E-01	nc	6.2E+00	nc	3.7E-02	nc	3.6E-01	nc		
		3.0E+00	i			3.0E+00	r	0 0.10	84-72-0	Ethylphthalyl ethyl glycolate	1.0E+05	max	1.0E+05	max	1.1E+04	nc	1.1E+05	nc		
		8.0E-03	i			8.0E-03	r	0 0.10	101200-48-0	Express	4.9E+02	nc	4.9E+03	nc	2.9E+01	nc	2.9E+02	nc		
		2.5E-04	i			2.5E-04	r	0 0.10	22224-92-6	Fenamiphos	1.5E+01	nc	1.5E+02	nc	9.1E-01	nc	9.1E+00	nc		
		1.3E-02	i			1.3E-02	r	0 0.10	2164-17-2	Fluometuron	7.9E+02	nc	8.0E+03	nc	4.7E+01	nc	4.7E+02	nc		
		6.0E-02	i					0 0.10	16984-48-8	Flouride	3.7E+03	nc	3.7E+04	nc			2.2E+03	nc		
		8.0E-02	i			8.0E-02	r	0 0.10	59756-60-4	Fluoridone	4.9E+03	nc	4.9E+04	nc	2.9E+02	nc	2.9E+03	nc		
		2.0E-02	i			2.0E-02	r	0 0.10	56425-91-3	Flurprimidol	1.2E+03	nc	1.2E+04	nc	7.3E+01	nc	7.3E+02	nc		
		6.0E-02	i			6.0E-02	r	0 0.10	66332-96-5	Flutolanil	3.7E+03	nc	3.7E+04	nc	2.2E+02	nc	2.2E+03	nc		
		1.0E-02	i			1.0E-02	r	0 0.10	69409-94-5	Fluvalinate	6.1E+02	nc	6.2E+03	nc	3.7E+01	nc	3.6E+02	nc		
3.5E-03	i	1.0E-01	i	3.5E-03	r	1.0E-01	r	0 0.10	133-07-3	Folpet	1.4E+02	ca*	4.9E+02	ca	1.9E+00	ca	1.9E+01	ca		
1.9E-01	i			1.9E-01	r			0 0.10	72178-02-0	Fomesafen	2.6E+00	ca	9.1E+00	ca	3.5E-02	ca	3.5E-01	ca		
		2.0E-03	i			2.0E-03	r	0 0.10	944-22-9	Fonofos	1.2E+02	nc	1.2E+03	nc	7.3E+00	nc	7.3E+01	nc		
		1.5E-01	i	4.6E-02	i			0 0.10	50-00-0	Formaldehyde	9.2E+03	nc	1.0E+05	nc	1.5E-01	ca	5.5E+03	nc		
		2.0E+00	h			2.0E+00	r	0 0.10	64-18-6	Formic Acid	1.0E+05	max	1.0E+05	max	7.3E+03	nc	7.3E+04	nc		
		3.0E+00	i			3.0E+00	r	0 0.10	39148-24-8	Fosetyl-al	1.0E+05	max	1.0E+05	max	1.1E+04	nc	1.1E+05	nc		
		3.0E+01	i			8.6E+00	h	1	76-13-1	Freon 113	5.6E+03	sat	5.6E+03	sat	3.1E+04	nc	5.9E+04	nc		
		1.0E-03	i			1.0E-03	r	1	110-00-9	Furan	2.5E+00	nc	8.5E+00	nc	3.7E+00	nc	6.1E+00	nc		
3.8E+00	h			3.8E+00	r			0 0.10	67-45-8	Furazolidone	1.3E-01	ca	4.5E-01	ca	1.8E-03	ca	1.8E-02	ca		
		3.0E-03	i			1.4E-02	h	0 0.10	98-01-1	Furfural	1.8E+02	nc	1.8E+03	nc	5.2E+01	nc	1.1E+02	nc		

Key : SFo,i=Cancer Slope Factor oral, inhalation RfDo,i=Reference Dose oral, inhalation i=IRIS h=HEAST n=NCEA x=Withdrawn o=Other EPA Source r=Route-extrapolation ca=Cancer PRG nc=Noncancer PRG ca* (where: nc < 100X ca) ca**(where: nc < 10X ca)
+++=Non-Standard Method Applied (See Section 2.3 of the "Region 9 PRGs Table User's Guide") sat=Soil Saturation (See Section 4.5) max=Ceiling limit (See Section 2.1) DAF=Dilution Attenuation Factor (See Section 2.5) CAS=Chemical Abstract Services

TOXICITY INFORMATION										CONTAMINANT	PRELIMINARY REMEDIAL GOALS (PRGs) "Direct Contact Exposure Pathways"								SOIL SCREENING LEVELS "Migration to Ground Water"	
SFo 1/(mg/kg-d)		RfDo (mg/kg-d)		SFi 1/(mg/kg-d)		RfDi (mg/kg-d)		V O C	skin abs. soils	CAS No.		Residential Soil (mg/kg)		Industrial Soil (mg/kg)		Ambient Air (ug/m^3)		Tap Water (ug/l)		DAF 20 (mg/kg)	DAF 1 (mg/kg)
5.0E+01	h			5.0E+01	r			0	0.10	531-82-8	Furium	9.7E-03	ca	3.4E-02	ca	1.3E-04	ca	1.3E-03	ca		
3.0E-02	i			3.0E-02	r			0	0.10	60568-05-0	Furmecyclox	1.6E+01	ca	5.7E+01	ca	2.2E-01	ca	2.2E+00	ca		
		4.0E-04	i			4.0E-04	r	0	0.10	77182-82-2	Glufosinate-ammonium	2.4E+01	nc	2.5E+02	nc	1.5E+00	nc	1.5E+01	nc		
		4.0E-04	i			2.9E-04	h	0	0.10	765-34-4	Glycidaldehyde	2.4E+01	nc	2.5E+02	nc	1.0E+00	nc	1.5E+01	nc		
		1.0E-01	i			1.0E-01	r	0	0.10	1071-83-6	Glyphosate	6.1E+03	nc	6.2E+04	nc	3.7E+02	nc	3.6E+03	nc		
		5.0E-05	i			5.0E-05	r	0	0.10	69806-40-2	Haloxyfop-methyl	3.1E+00	nc	3.1E+01	nc	1.8E-01	nc	1.8E+00	nc		
		1.3E-02	i			1.3E-02	r	0	0.10	79277-27-3	Harmony	7.9E+02	nc	8.0E+03	nc	4.7E+01	nc	4.7E+02	nc		
4.5E+00	i	5.0E-04	i	4.6E+00	i	5.0E-04	r	0	0.10	76-44-8	Heptachlor	1.1E-01	ca	3.8E-01	ca	1.5E-03	ca	1.5E-02	ca	2.3E+01	1.0E+00
9.1E+00	i	1.3E-05	i	9.1E+00	i	1.3E-05	r	0	0.10	1024-57-3	Heptachlor epoxide	5.3E-02	ca*	1.9E-01	ca*	7.4E-04	ca*	7.4E-03	ca*	7.0E-01	3.0E-02
		2.0E-03	i			2.0E-03	r	0	0.10	87-82-1	Hexabromobenzene	1.2E+02	nc	1.2E+03	nc	7.3E+00	nc	7.3E+01	nc		
1.6E+00	i	8.0E-04	i	1.6E+00	i	8.0E-04	r	0	0.10	118-74-1	Hexachlorobenzene	3.0E-01	ca	1.1E+00	ca	4.2E-03	ca	4.2E-02	ca	2.0E+00	1.0E-01
7.8E-02	i	3.00E-04	n	7.8E-02	i	3.00E-04	r	0	0.10	87-68-3	Hexachlorobutadiene	6.2E+00	ca**	2.2E+01	ca**	8.6E-02	ca*	8.6E-01	ca*	2.0E+00	1.0E-01
6.3E+00	i	5.0E-04	n	6.3E+00	i	5.0E-04	r	0	0.04	319-84-6	**HCH (alpha)**	9.0E-02	ca	3.6E-01	ca	1.1E-03	ca	1.1E-02	ca	5.0E-04	3.0E-05
1.8E+00	i	2.0E-04	n	1.8E+00	i	2.0E-04	r	0	0.04	319-85-7	**HCH (beta)**	3.2E-01	ca	1.3E+00	ca	3.7E-03	ca	3.7E-02	ca	3.0E-03	1.0E-04
1.3E+00	h	3.0E-04	i	1.3E+00	r	3.0E-04	r	0	0.04	58-89-9	HCH (gamma) Lindane	4.4E-01	ca*	1.7E+00	ca	5.2E-03	ca	5.2E-02	ca	9.0E-03	5.0E-04
1.8E+00	i			1.8E+00	i			0	0.04	608-73-1	HCH-technical	3.2E-01	ca	1.3E+00	ca	3.8E-03	ca	3.7E-02	ca	3.0E-03	1.0E-04
		6.0E-03	i			5.7E-05	i	0	0.10	77-47-4	**Hexachlorocyclopentadiene**	3.7E+02	nc	3.7E+03	nc	2.1E-01	nc	2.2E+02	nc	4.0E+02	2.0E+01
1.4E-02	i	1.0E-03	i	1.4E-02	i	1.0E-03	r	0	0.10	67-72-1	Hexachloroethane	3.5E+01	ca**	1.2E+02	ca**	4.8E-01	ca**	4.8E+00	ca**	5.0E-01	2.0E-02
		3.0E-04	i			3.0E-04	r	0	0.10	70-30-4	Hexachlorophene	1.8E+01	nc	1.8E+02	nc	1.1E+00	nc	1.1E+01	nc		
1.1E-01	i	3.0E-03	i	1.1E-01	r	3.0E-03	r	0	0.10	121-82-4	Hexahydro-1,3,5-trinitro-1,3,5-triazine	4.4E+00	ca*	1.6E+01	ca	6.1E-02	ca	6.1E-01	ca		
		2.9E-06	r			2.9E-06	i	0	0.10	822-06-0	1,6-Hexamethylene diisocyanate	1.7E-01	nc	1.8E+00	nc	1.0E-02	nc	1.0E-01	nc		
		6.0E-02	h			5.7E-02	i	1		110-54-3	n-Hexane	1.1E+02	sat	1.1E+02	sat	2.1E+02	nc	3.5E+02	nc		
		3.3E-02	i			3.3E-02	r	0	0.10	51235-04-2	Hexazinone	2.0E+03	nc	2.0E+04	nc	1.2E+02	nc	1.2E+03	nc		
3.0E+00	i			1.7E+01	i			0	0.10	302-01-2	Hydrazine, hydrazine sulfate	1.6E-01	ca	5.7E-01	ca	3.9E-04	ca	2.2E-02	ca		
3.0E+00	n			1.7E+01	n				0.10	60-34-4	Hydrazine, monomethyl	1.6E-01	ca	5.7E-01	ca	4.0E-04	ca	2.2E-02	ca		
3.0E+00	n			1.7E+01	n				0.10	57-14-7	Hydrazine, dimethyl	1.6E-01	ca	5.7E-01	ca	4.0E-04	ca	2.2E-02	ca		
						5.7E-03	i			7647-01-0	Hydrogen chloride					2.1E+01	nc				
		2.0E-02	i			8.6E-04	i	1		74-90-8	Hydrogen cyanide	1.1E+01	nc	3.5E+01	nc	3.1E+00	nc	6.2E+00	nc		
		3.0E-03	i			2.9E-04	i			7783-06-4	Hydrogen sulfide					1.0E+00	nc	1.1E+02	nc		
		4.0E-02	h			4.0E-02	r	0	0.10	123-31-9	p-Hydroquinone	2.4E+03	nc	2.5E+04	nc	1.5E+02	nc	1.5E+03	nc		
		1.3E-02	i			1.3E-02	r	0	0.10	35554-44-0	Imazalil	7.9E+02	nc	8.0E+03	nc	4.7E+01	nc	4.7E+02	nc		
		2.5E-01	i			2.5E-01	r	0	0.10	81335-37-7	Imazaquin	1.5E+04	nc	1.0E+05	max	9.1E+02	nc	9.1E+03	nc		
		4.0E-02	i			4.0E-02	r	0	0.10	36734-19-7	Iprodione	2.4E+03	nc	2.5E+04	nc	1.5E+02	nc	1.5E+03	nc		
		3.0E-01	n					0		7439-89-6	Iron	2.3E+04	nc	1.0E+05	max			1.1E+04	nc		
		3.0E-01	i			3.0E-01	r	1		78-83-1	Isobutanol	1.3E+04	nc	4.0E+04	sat	1.1E+03	nc	1.8E+03	nc		
9.5E-04	i	2.0E-01	i	9.5E-04	r	2.0E-01	r	0	0.10	78-59-1	Isophorone	5.1E+02	ca*	1.8E+03	ca*	7.1E+00	ca	7.1E+01	ca	5.0E-01	3.0E-02

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TOXICITY INFORMATION										CONTAMINANT	PRELIMINARY REMEDIAL GOALS (PRGs) "Direct Contact Exposure Pathways"								SOIL SCREENING LEVELS "Migration to Ground Water"	
SFo 1/(mg/kg-d)		RfDo (mg/kg-d)		SFi 1/(mg/kg-d)		RfDi (mg/kg-d)		VOC	skin abs. soils	CAS No.		Residential Soil (mg/kg)		Industrial Soil (mg/kg)		Ambient Air (ug/m^3)		Tap Water (ug/l)		DAF 20 (mg/kg)	DAF 1 (mg/kg)
		1.5E-02	i			1.5E-02	r	0	0.10	33820-53-0	Isopropalin	9.2E+02	nc	9.2E+03	nc	5.5E+01	nc	5.5E+02	nc		
		1.0E-01	i			1.1E-01	r	0	0.10	1832-54-8	Isopropyl methyl phosphonic acid	6.1E+03	nc	6.2E+04	nc	4.0E+02	nc	3.6E+03	nc		
		5.0E-02	i			5.0E-02	r	0	0.10	82558-50-7	Isoxaben	3.1E+03	nc	3.1E+04	nc	1.8E+02	nc	1.8E+03	nc		
8.0E+00	n	3.0E-04	n	8.0E+00	r	3.0E-04	r	0	0.10	143-50-0	**Kepone**	6.1E-02	ca	2.2E-01	ca	8.4E-04	ca	8.4E-03	ca		
		2.0E-03	i			2.0E-03	r	0	0.10	77501-63-4	Lactofen	1.2E+02	nc	1.2E+03	nc	7.3E+00	nc	7.3E+01	nc		
For info see:		www.epa.gov/oerrpage/superfund/programs/lead/prods.htm#guidance								7439-92-1	Lead+++	4.0E+02	nc	7.5E+02	nc						
For info see:		www.dtsc.ca.gov/ScienceTechnology/ledspred.html									**Lead "CAL-Modified PRG"+++**	1.5E+02									
		1.0E-07	i					0	0.10	78-00-2	Lead (tetraethyl)	6.1E-03	nc	6.2E-02	nc			3.6E-03	nc		
		2.0E-03	i			2.0E-03	r	0	0.10	330-55-2	Linuron	1.2E+02	nc	1.2E+03	nc	7.3E+00	nc	7.3E+01	nc		
		2.0E-02	x					0		7439-93-2	Lithium	1.6E+03	nc	2.0E+04	nc			7.3E+02	nc		
		2.0E-01	i			2.0E-01	r	0	0.10	83055-99-6	Londax	1.2E+04	nc	1.0E+05	max	7.3E+02	nc	7.3E+03	nc		
		2.0E-02	i			2.0E-02	r	0	0.10	121-75-5	Malathion	1.2E+03	nc	1.2E+04	nc	7.3E+01	nc	7.3E+02	nc		
		1.0E-01	i			1.0E-01	r	0	0.10	108-31-6	Maleic anhydride	6.1E+03	nc	6.2E+04	nc	3.7E+02	nc	3.6E+03	nc		
		5.0E-01	i			5.0E-01	r	1		123-33-1	Maleic hydrazide	1.7E+03	nc	2.4E+03	sat	1.8E+03	nc	3.0E+03	nc		
		2.0E-05	h			2.0E-05	r	0	0.10	109-77-3	Malononitrile	1.2E+00	nc	1.2E+01	nc	7.3E-02	nc	7.3E-01	nc		
		3.0E-02	h			3.0E-02	r	0	0.10	8018-01-7	Mancozeb	1.8E+03	nc	1.8E+04	nc	1.1E+02	nc	1.1E+03	nc		
6.0E-02	o	5.0E-03	i	6.0E-02	r	5.0E-03	r	0	0.10	12427-38-2	Maneb	8.1E+00	ca*	2.9E+01	ca	1.1E-01	ca	1.1E+00	ca		
		2.4E-02	i			1.4E-05	i	0		7439-96-5	Manganese and compounds+++	1.8E+03	nc	1.9E+04	nc	5.1E-02	nc	8.8E+02	nc		
		9.0E-05	h			9.0E-05	r	0	0.10	950-10-7	Mephosfolan	5.5E+00	nc	5.5E+01	nc	3.3E-01	nc	3.3E+00	nc		
		3.0E-02	i			3.0E-02	r	0	0.10	24307-26-4	Mepiquat chloride	1.8E+03	nc	1.8E+04	nc	1.1E+02	nc	1.1E+03	nc		
2.9E-02	n	1.0E-01	n	2.9E-02	r	1.0E-01	r	0	0.10	149-30-4	2-Mercaptobenzothiazole	1.7E+01	ca	5.9E+01	ca	2.3E-01	ca	2.3E+00	ca		
		3.0E-04	i					0		7487-94-7	Mercury and compounds	2.3E+01	nc	3.1E+02	nc			1.1E+01	nc		
						8.6E-05	i			7439-97-6	Mercury (elemental)					3.1E-01	nc				
		1.0E-04	i					0	0.10	22967-92-6	Mercury (methyl)	6.1E+00	nc	6.2E+01	nc			3.6E+00	nc		
		3.0E-05	i			3.0E-05	r	0	0.10	150-50-5	Merphos	1.8E+00	nc	1.8E+01	nc	1.1E-01	nc	1.1E+00	nc		
		3.0E-05	i			3.0E-05	r	0	0.10	78-48-8	Merphos oxide	1.8E+00	nc	1.8E+01	nc	1.1E-01	nc	1.1E+00	nc		
		6.0E-02	i			6.0E-02	r	0	0.10	57837-19-1	Metalaxyl	3.7E+03	nc	3.7E+04	nc	2.2E+02	nc	2.2E+03	nc		
		1.0E-04	i			2.0E-04	h	1		126-98-7	Methacrylonitrile	2.1E+00	nc	8.4E+00	nc	7.3E-01	nc	1.0E+00	nc		
		5.0E-05	i			5.0E-05	r	0	0.10	10265-92-6	Methamidophos	3.1E+00	nc	3.1E+01	nc	1.8E-01	nc	1.8E+00	nc		
		5.0E-01	i			5.0E-01	r	0	0.10	67-56-1	Methanol	3.1E+04	nc	1.0E+05	max	1.8E+03	nc	1.8E+04	nc		
		1.0E-03	i			1.0E-03	r	0	0.10	950-37-8	Methidathion	6.1E+01	nc	6.2E+02	nc	3.7E+00	nc	3.6E+01	nc		
		2.5E-02	i			2.5E-02	r	1		16752-77-5	Methomyl	4.4E+01	nc	1.5E+02	nc	9.1E+01	nc	1.5E+02	nc		
		5.0E-03	i			5.0E-03	r	0	0.10	72-43-5	Methoxychlor	3.1E+02	nc	3.1E+03	nc	1.8E+01	nc	1.8E+02	nc	1.6E+02	8.0E+00
		1.0E-03	h			5.7E-03	i	0	0.10	109-86-4	2-Methoxyethanol	6.1E+01	nc	6.2E+02	nc	2.1E+01	nc	3.6E+01	nc		
		2.0E-03	h			2.0E-03	r	0	0.10	110-49-6	2-Methoxyethanol acetate	1.2E+02	nc	1.2E+03	nc	7.3E+00	nc	7.3E+01	nc		
4.6E-02	h			4.6E-02	r			0	0.10	99-59-2	2-Methoxy-5-nitroaniline	1.1E+01	ca	3.7E+01	ca	1.5E-01	ca	1.5E+00	ca		

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+++=Non-Standard Method Applied (See Section 2.3 of the "Region 9 PRGs Table User's Guide") sat=Soil Saturation (See Section 4.5) max=Ceiling limit (See Section 2.1) DAF=Dilution Attenuation Factor (See Section 2.5) CAS=Chemical Abstract Services

TOXICITY INFORMATION										CONTAMINANT	PRELIMINARY REMEDIAL GOALS (PRGs) "Direct Contact Exposure Pathways"								SOIL SCREENING LEVELS "Migration to Ground Water"	
SFo 1/(mg/kg-d)		RfDo (mg/kg-d)		SFi 1/(mg/kg-d)		RfDi (mg/kg-d)		VOC	skin abs. soils	CAS No.		Residential Soil (mg/kg)		Industrial Soil (mg/kg)		Ambient Air (ug/m^3)		Tap Water (ug/l)		DAF 20 (mg/kg)	DAF 1 (mg/kg)
		1.0E+00	h			1.0E+00	r	1		79-20-9	Methyl acetate	2.2E+04	nc	9.2E+04	nc	3.7E+03	nc	6.1E+03	nc		
		3.0E-02	h			3.0E-02	r	1		96-33-3	Methyl acrylate	7.0E+01	nc	2.3E+02	nc	1.1E+02	nc	1.8E+02	nc		
2.4E-01	h			2.4E-01	r			0	0.10	95-53-4	2-Methylaniline (o-toluidine)	2.0E+00	ca	7.2E+00	ca	2.8E-02	ca	2.8E-01	ca		
1.8E-01	h			1.8E-01	r			0	0.10	636-21-5	2-Methylaniline hydrochloride	2.7E+00	ca	9.6E+00	ca	3.7E-02	ca	3.7E-01	ca		
		5.0E-04	i			5.0E-04	r	0	0.10	94-74-6	2-Methyl-4-chlorophenoxyacetic acid	3.1E+01	nc	3.1E+02	nc	1.8E+00	nc	1.8E+01	nc		
		1.0E-02	i			1.0E-02	r	0	0.10	94-81-5	4-(2-Methyl-4-chlorophenoxy) butyric acid	6.1E+02	nc	6.2E+03	nc	3.7E+01	nc	3.6E+02	nc		
		1.0E-03	i			1.0E-03	r	0	0.10	93-65-2	2-(2-Methyl-4-chlorophenoxy) propionic acid	6.1E+01	nc	6.2E+02	nc	3.7E+00	nc	3.6E+01	nc		
		1.0E-03	i			1.0E-03	r	0	0.10	16484-77-8	2-(2-Methyl-1,4-chlorophenoxy) propionic acid	6.1E+01	nc	6.2E+02	nc	3.7E+00	nc	3.6E+01	nc		
		8.6E-01	r			8.6E-01	h	1		108-87-2	Methylcyclohexane	2.6E+03	nc	8.7E+03	nc	3.1E+03	nc	5.2E+03	nc		
2.5E-01	h			2.5E-01	r			0	0.10	101-77-9	4,4'-Methylenebisbenzeneamine	1.9E+00	ca	6.9E+00	ca	2.7E-02	ca	2.7E-01	ca		
1.3E-01	h	7.0E-04	h	1.3E-01	h	7.0E-04	r	0	0.10	101-14-4	4,4'-Methylene bis(2-chloroaniline)	3.7E+00	ca*	1.3E+01	ca*	5.2E-02	ca*	5.2E-01	ca*		
4.6E-02	i			4.6E-02	r			0	0.10	101-61-1	4,4'-Methylene bis(N,N'-dimethyl)aniline	1.1E+01	ca	3.7E+01	ca	1.5E-01	ca	1.5E+00	ca		
		1.0E-02	h			1.0E-02	r	1		74-95-3	Methylene bromide	6.7E+01	nc	2.3E+02	nc	3.7E+01	nc	6.1E+01	nc		
7.5E-03	i	6.0E-02	i	1.6E-03	i	8.6E-01	h	1		75-09-2	Methylene chloride	9.1E+00	ca	2.1E+01	ca	4.1E+00	ca	4.3E+00	ca	2.0E-02	1.0E-03
		1.7E-04	r			1.7E-04	i	0	0.10	101-68-8	4,4'-Methylene diphenyl diisocyanate	1.0E+01	nc	1.0E+02	nc	6.2E-01	nc	6.2E+00	nc		
		6.0E-01	i			2.9E-01	i	1		78-93-3	Methyl ethyl ketone	7.3E+03	nc	2.7E+04	nc	1.0E+03	nc	1.9E+03	nc		
		8.0E-02	h			2.3E-02	h	1		108-10-1	Methyl isobutyl ketone	7.9E+02	nc	2.8E+03	nc	8.3E+01	nc	1.6E+02	nc		
		5.7E-04	r			5.7E-04	n	0	0.10	74-93-1	Methyl Mercaptan	3.5E+01	nc	3.5E+02	nc	2.1E+00	nc	2.1E+01	nc		
		1.4E+00	i			2.0E-01	i	1		80-62-6	Methyl methacrylate	2.2E+03	nc	2.7E+03	sat	7.3E+02	nc	1.4E+03	nc		
3.3E-02	h			3.3E-02	r			0	0.10	99-55-8	2-Methyl-5-nitroaniline	1.5E+01	ca	5.2E+01	ca	2.0E-01	ca	2.0E+00	ca		
		2.5E-04	i			2.5E-04	r	0	0.10	298-00-0	Methyl parathion	1.5E+01	nc	1.5E+02	nc	9.1E-01	nc	9.1E+00	nc		
		5.0E-02	i			5.0E-02	r	0	0.10	95-48-7	2-Methylphenol	3.1E+03	nc	3.1E+04	nc	1.8E+02	nc	1.8E+03	nc	1.5E+01	8.0E-01
		5.0E-02	i			5.0E-02	r	0	0.10	108-39-4	3-Methylphenol	3.1E+03	nc	3.1E+04	nc	1.8E+02	nc	1.8E+03	nc		
		5.0E-03	h			5.0E-03	r	0	0.10	106-44-5	4-Methylphenol	3.1E+02	nc	3.1E+03	nc	1.8E+01	nc	1.8E+02	nc		
		2.0E-02	n			2.0E-02	r	0	0.10	993-13-5	Methyl phosphonic acid	1.2E+03	nc	1.2E+04	nc	7.3E+01	nc	7.3E+02	nc		
		6.0E-03	h			1.1E-02	h	1		25013-15-4	Methyl styrene (mixture)	1.3E+02	nc	5.4E+02	nc	4.2E+01	nc	6.0E+01	nc		
		7.0E-02	h			7.0E-02	r	1		98-83-9	Methyl styrene (alpha)	6.8E+02	sat	6.8E+02	sat	2.6E+02	nc	4.3E+02	nc		
3.3E-03	n	8.6E-01	r	3.5E-04	n	8.6E-01	i	1		1634-04-4	**Methyl tertbutyl ether (MTBE)**	6.2E+01	ca*	1.6E+02	ca	1.9E+01	ca	1.3E+01	ca		
1.8E-03				1.8E-03				1			"CAL-Modified PRG"	1.7E+01	ca	3.6E+01	ca	3.7E+00	ca	6.2E+00	ca		
		1.5E-01	i			1.5E-01	r	0	0.10	51218-45-2	Metolaclor (Dual)	9.2E+03	nc	9.2E+04	nc	5.5E+02	nc	5.5E+03	nc		
		2.5E-02	i			2.5E-02	r	0	0.10	21087-64-9	Metribuzin	1.5E+03	nc	1.5E+04	nc	9.1E+01	nc	9.1E+02	nc		
1.8E+00	x	2.0E-04	i	1.8E+00	r	2.0E-04	r	0	0.10	2385-85-5	Mirex	2.7E-01	ca*	9.6E-01	ca	3.7E-03	ca	3.7E-02	ca		
		2.0E-03	i			2.0E-03	r	0	0.10	2212-67-1	Molinate	1.2E+02	nc	1.2E+03	nc	7.3E+00	nc	7.3E+01	nc		
		5.0E-03	i					0		7439-98-7	Molybdenum	3.9E+02	nc	5.1E+03	nc			1.8E+02	nc		
		1.0E-01	i			1.0E-01	r	0	0.10	10599-90-3	Monochloramine	6.1E+03	nc	6.2E+04	nc	3.7E+02	nc	3.6E+03	nc		
		2.0E-03	i			2.0E-03	r	0	0.10	300-76-5	Naled	1.2E+02	nc	1.2E+03	nc	7.3E+00	nc	7.3E+01	nc		

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TOXICITY INFORMATION									CONTAMINANT	PRELIMINARY REMEDIAL GOALS (PRGs) "Direct Contact Exposure Pathways"								SOIL SCREENING LEVELS "Migration to Ground Water"	
SFo 1/(mg/kg-d)		RfDo (mg/kg-d)		SFi 1/(mg/kg-d)		RfDi (mg/kg-d)		VOC skin abs. soils	CAS No.		Residential Soil (mg/kg)		Industrial Soil (mg/kg)		Ambient Air (ug/m^3)		Tap Water (ug/l)		DAF 20 (mg/kg)	DAF 1 (mg/kg)
		1.0E-01	i			1.0E-01	r	0 0.10	15299-99-7	Napropamide	6.1E+03	nc	6.2E+04	nc	3.7E+02	nc	3.6E+03	nc		
		2.0E-02	i					0	7440-02-0	Nickel (soluble salts)	1.6E+03	nc	2.0E+04	nc			7.3E+02	nc	1.3E+02	7.0E+00
				8.4E-01	i			0		Nickel refinery dust					8.0E-03	ca				
				1.7E+00	i			0	12035-72-2	Nickel subsulfide			1.1E+04	ca	4.0E-03	ca				
Tap Water PRG Based on Infant NOAEL (see IRIS)									14797-55-8	Nitrate+++							1.0E+04	nc		
Tap Water PRG Based on Infant NOAEL (see IRIS)									14797-65-0	Nitrite+++							1.0E+03	nc		
		2.86E-05	r			2.86E-05	h	0 0.10	88-74-4	**2-Nitroaniline**	1.7E+00	nc	1.8E+01	nc	1.0E-01	nc	1.0E+00	nc		
		5.0E-04	i			5.7E-04	h	1	98-95-3	Nitrobenzene	2.0E+01	nc	1.0E+02	nc	2.1E+00	nc	3.4E+00	nc	1.0E-01	7.0E-03
		7.0E-02	h			7.0E-02	r	0 0.10	67-20-9	Nitrofurantoin	4.3E+03	nc	4.3E+04	nc	2.6E+02	nc	2.6E+03	nc		
1.5E+00	h			1.5E+00	r			0 0.10	59-87-0	Nitrofurazone	3.2E-01	ca	1.1E+00	ca	4.5E-03	ca	4.5E-02	ca		
1.4E-02	n			1.4E-02	r			0 0.10	55-63-0	Nitroglycerin	3.5E+01	ca	1.2E+02	ca	4.8E-01	ca	4.8E+00	ca		
		1.0E-01	i			1.0E-01	r	0 0.10	556-88-7	Nitroguanidine	6.1E+03	nc	6.2E+04	nc	3.7E+02	nc	3.6E+03	nc		
9.4E+00	r	5.7E-03	r	9.4E+00	h	5.7E-03	i	1	79-46-9	2-Nitropropane					7.2E-04	ca	1.2E-03	ca		
5.4E+00	i			5.6E+00	i			1	924-16-3	N-Nitrosodi-n-butylamine	2.4E-02	ca	5.8E-02	ca	1.2E-03	ca	2.0E-03	ca		
2.8E+00	i			2.8E+00	r			0 0.10	1116-54-7	N-Nitrosodiethanolamine	1.7E-01	ca	6.2E-01	ca	2.4E-03	ca	2.4E-02	ca		
1.5E+02	i			1.5E+02	i			0 0.10	55-18-5	N-Nitrosodiethylamine	3.2E-03	ca	1.1E-02	ca	4.5E-05	ca	4.5E-04	ca		
5.1E+01	i			4.9E+01	i			0 0.10	62-75-9	N-Nitrosodimethylamine	9.5E-03	ca	3.4E-02	ca	1.4E-04	ca	1.3E-03	ca		
4.9E-03	i			4.9E-03	r			0 0.10	86-30-6	N-Nitrosodiphenylamine	9.9E+01	ca	3.5E+02	ca	1.4E+00	ca	1.4E+01	ca	1.0E+00	6.0E-02
7.0E+00	i			7.0E+00	r			0 0.10	621-64-7	N-Nitroso di-n-propylamine	6.9E-02	ca	2.5E-01	ca	9.6E-04	ca	9.6E-03	ca	5.0E-05	2.0E-06
2.2E+01	i			2.2E+01	r			0 0.10	10595-95-6	N-Nitroso-N-methylethylamine	2.2E-02	ca	7.8E-02	ca	3.1E-04	ca	3.1E-03	ca		
2.1E+00	i			2.1E+00	i			0 0.10	930-55-2	N-Nitrosopyrrolidine	2.3E-01	ca	8.2E-01	ca	3.1E-03	ca	3.2E-02	ca		
		1.0E-02	h			1.0E-02	r	1	99-08-1	m-Nitrotoluene	3.7E+02	nc	1.0E+03	sat	3.7E+01	nc	6.1E+01	nc		
		1.0E-02	h			1.0E-02	r	1	99-08-1	o-Nitrotoluene	3.7E+02	nc	1.0E+03	sat	3.7E+01	nc	6.1E+01	nc		
		1.0E-02	h			1.0E-02	r	1	99-99-0	p-Nitrotoluene	3.7E+02	nc	1.0E+03	sat	3.7E+01	nc	6.1E+01	nc		
		4.0E-02	i			4.0E-02	r	0 0.10	27314-13-2	Norflurazon	2.4E+03	nc	2.5E+04	nc	1.5E+02	nc	1.5E+03	nc		
		7.0E-04	i			7.0E-04	r	0 0.10	85509-19-9	NuStar	4.3E+01	nc	4.3E+02	nc	2.6E+00	nc	2.6E+01	nc		
		3.0E-03	i			3.0E-03	r	0 0.10	32536-52-0	Octabromodiphenyl ether	1.8E+02	nc	1.8E+03	nc	1.1E+01	nc	1.1E+02	nc		
		5.0E-02	i			5.0E-02	r	0 0.10	2691-41-0	Octahydro-1357-tetranitro-1357- tetrazocine (HMX)	3.1E+03	nc	3.1E+04	nc	1.8E+02	nc	1.8E+03	nc		
		2.0E-03	h			2.0E-03	r	0 0.10	152-16-9	Octamethylpyrophosphoramide	1.2E+02	nc	1.2E+03	nc	7.3E+00	nc	7.3E+01	nc		
		5.0E-02	i			5.0E-02	r	0 0.10	19044-88-3	Oryzalin	3.1E+03	nc	3.1E+04	nc	1.8E+02	nc	1.8E+03	nc		
		5.0E-03	i			5.0E-03	r	0 0.10	19666-30-9	Oxadiazon	3.1E+02	nc	3.1E+03	nc	1.8E+01	nc	1.8E+02	nc		
		2.5E-02	i			2.5E-02	r	0 0.10	23135-22-0	Oxamyl	1.5E+03	nc	1.5E+04	nc	9.1E+01	nc	9.1E+02	nc		
		3.0E-03	i			3.0E-03	r	0 0.10	42874-03-3	Oxyfluorfen	1.8E+02	nc	1.8E+03	nc	1.1E+01	nc	1.1E+02	nc		
		1.3E-02	i			1.3E-02	r	0 0.10	76738-62-0	Paclobutrazol	7.9E+02	nc	8.0E+03	nc	4.7E+01	nc	4.7E+02	nc		
		4.5E-03	i			4.5E-03	r	0 0.10	4685-14-7	Paraquat	2.7E+02	nc	2.8E+03	nc	1.6E+01	nc	1.6E+02	nc		
		6.0E-03	h			6.0E-03	r	0 0.10	56-38-2	Parathion	3.7E+02	nc	3.7E+03	nc	2.2E+01	nc	2.2E+02	nc		

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SFo 1/(mg/kg-d)		RfDo (mg/kg-d)		SFi 1/(mg/kg-d)		RfDi (mg/kg-d)		VOC	skin abs. soils	CAS No.		Residential Soil (mg/kg)		Industrial Soil (mg/kg)		Ambient Air (ug/m^3)		Tap Water (ug/l)		DAF 20 (mg/kg)	DAF 1 (mg/kg)
		5.0E-02	h			5.0E-02	r	0	0.10	1114-71-2	Pebulate	3.1E+03	nc	3.1E+04	nc	1.8E+02	nc	1.8E+03	nc		
		4.0E-02	i			4.0E-02	r	0	0.10	40487-42-1	Pendimethalin	2.4E+03	nc	2.5E+04	nc	1.5E+02	nc	1.5E+03	nc		
2.3E-02	h			2.3E-02	r			0	0.10	87-84-3	Pentabromo-6-chloro cyclohexane	2.1E+01	ca	7.5E+01	ca	2.9E-01	ca	2.9E+00	ca		
		2.0E-03	i			2.0E-03	r	0	0.10	32534-81-9	Pentabromodiphenyl ether	1.2E+02	nc	1.2E+03	nc	7.3E+00	nc	7.3E+01	nc		
		8.0E-04	i			8.0E-04	r	0	0.10	608-93-5	Pentachlorobenzene	4.9E+01	nc	4.9E+02	nc	2.9E+00	nc	2.9E+01	nc		
2.6E-01	h	3.0E-03	i	2.6E-01	r	3.0E-03	r	0	0.10	82-68-8	Pentachloronitrobenzene	1.9E+00	ca*	6.6E+00	ca	2.6E-02	ca	2.6E-01	ca		
1.2E-01	i	3.0E-02	i	1.2E-01	r	3.0E-02	r	0	0.25	87-86-5	Pentachlorophenol	3.0E+00	ca	9.0E+00	ca	5.6E-02	ca	5.6E-01	ca	3.0E-02	1.0E-03
		1.00E-04	x					0		7601-90-3	Perchlorate	7.8E+00	ca/nc	1.0E+02	ca/nc			3.6E+00	ca/nc		
		5.0E-02	i			5.0E-02	r	0	0.10	52645-53-1	Permethrin	3.1E+03	nc	3.1E+04	nc	1.8E+02	nc	1.8E+03	nc		
		2.5E-01	i			2.5E-01	r	0	0.10	13684-63-4	Phenmedipham	1.5E+04	nc	1.0E+05	max	9.1E+02	nc	9.1E+03	nc		
		6.0E-01	i			6.0E-01	r	0	0.10	108-95-2	Phenol	3.7E+04	nc	1.0E+05	max	2.2E+03	nc	2.2E+04	nc	1.0E+02	5.0E+00
		2.0E-03	n			2.0E-03	r	0	0.10	92-84-2	Phenothiazine	1.2E+02	nc	1.2E+03	nc	7.3E+00	nc	7.3E+01	nc		
		6.0E-03	i			6.0E-03	r	0	0.10	108-45-2	m-Phenylenediamine	3.7E+02	nc	3.7E+03	nc	2.2E+01	nc	2.2E+02	nc		
		1.9E-01	h			1.9E-01	r	0	0.10	106-50-3	p-Phenylenediamine	1.2E+04	nc	1.0E+05	max	6.9E+02	nc	6.9E+03	nc		
		8.0E-05	i			8.0E-05	r	0	0.10	62-38-4	Phenylmercuric acetate	4.9E+00	nc	4.9E+01	nc	2.9E-01	nc	2.9E+00	nc		
1.9E-03	h			1.9E-03	r			0	0.10	90-43-7	2-Phenylphenol	2.5E+02	ca	8.9E+02	ca	3.5E+00	ca	3.5E+01	ca		
		2.0E-04	h			2.0E-04	r	0	0.10	298-02-2	Phorate	1.2E+01	nc	1.2E+02	nc	7.3E-01	nc	7.3E+00	nc		
		2.0E-02	i			2.0E-02	r	0	0.10	732-11-6	Phosmet	1.2E+03	nc	1.2E+04	nc	7.3E+01	nc	7.3E+02	nc		
		3.0E-04	i			8.6E-05	i	0	0.10	7803-51-2	Phosphine	1.8E+01	nc	1.8E+02	nc	3.1E-01	nc	1.1E+01	nc		
						2.9E-03	i			7664-38-2	Phosphoric acid					1.0E+01	nc				
		2.0E-05	i					0		7723-14-0	Phosphorus (white)	1.6E+00	nc	2.0E+01	nc			7.3E-01	nc		
		1.0E+00	h			1.0E+00	r	0	0.10	100-21-0	p-Phthalic acid	6.1E+04	nc	1.0E+05	max	3.7E+03	nc	3.6E+04	nc		
		2.0E+00	i			3.4E-02	h	0	0.10	85-44-9	Phthalic anhydride	1.0E+05	max	1.0E+05	max	1.2E+02	nc	7.3E+04	nc		
		7.0E-02	i			7.0E-02	r	0	0.10	1918-02-1	Picloram	4.3E+03	nc	4.3E+04	nc	2.6E+02	nc	2.6E+03	nc		
		1.0E-02	i			1.0E-02	r	0	0.10	29232-93-7	Pirimiphos-methyl	6.1E+02	nc	6.2E+03	nc	3.7E+01	nc	3.6E+02	nc		
8.9E+00	h	7.0E-06	h	8.9E+00	r	7.0E-06	r	0	0.10		Polybrominated biphenyls	5.5E-02	ca**	1.9E-01	ca*	7.6E-04	ca*	7.6E-03	ca*		
2.0E+00	i			2.0E+00	i			0	0.14	1336-36-3	Polychlorinated biphenyls (PCBs)	2.2E-01	ca	7.4E-01	ca	3.4E-03	ca	3.4E-02	ca		
7.0E-02	i	7.0E-05	i	7.0E-02	i	7.0E-05	r	0	0.14	12674-11-2	Aroclor 1016	3.9E+00	nc	2.1E+01	ca**	9.6E-02	ca**	9.6E-01	ca**		
2.0E+00	i			2.0E+00	i			0	0.14	11104-28-2	Aroclor 1221	2.2E-01	ca	7.4E-01	ca	3.4E-03	ca	3.4E-02	ca		
2.0E+00	i			2.0E+00	i			0	0.14	11141-16-5	Aroclor 1232	2.2E-01	ca	7.4E-01	ca	3.4E-03	ca	3.4E-02	ca		
2.0E+00	i			2.0E+00	i			0	0.14	53469-21-9	Aroclor 1242	2.2E-01	ca	7.4E-01	ca	3.4E-03	ca	3.4E-02	ca		
2.0E+00	i			2.0E+00	i			0	0.14	12672-29-6	Aroclor 1248	2.2E-01	ca	7.4E-01	ca	3.4E-03	ca	3.4E-02	ca		
2.0E+00	i	2.0E-05	i	2.0E+00	i	2.0E-05	r	0	0.14	11097-69-1	Aroclor 1254	2.2E-01	ca**	7.4E-01	ca*	3.4E-03	ca*	3.4E-02	ca*		
2.0E+00	i			2.0E+00	i			0	0.14	11096-82-5	Aroclor 1260	2.2E-01	ca	7.4E-01	ca	3.4E-03	ca	3.4E-02	ca		

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+++=Non-Standard Method Applied (See Section 2.3 of the "Region 9 PRGs Table User's Guide") sat=Soil Saturation (See Section 4.5) max=Ceiling limit (See Section 2.1) DAF=Dilution Attenuation Factor (See Section 2.5) CAS=Chemical Abstract Services

TOXICITY INFORMATION										CONTAMINANT	PRELIMINARY REMEDIAL GOALS (PRGs) "Direct Contact Exposure Pathways"								SOIL SCREENING LEVELS "Migration to Ground Water"	
SFo 1/(mg/kg-d)		RfDo (mg/kg-d)		SFi 1/(mg/kg-d)		RfDi (mg/kg-d)		VOC	skin abs. soils	CAS No.		Residential Soil (mg/kg)		Industrial Soil (mg/kg)		Ambient Air (ug/m^3)		Tap Water (ug/l)		DAF 20 (mg/kg)	DAF 1 (mg/kg)
4.5E+00	n			4.5E+00	r				0.10	61788-33-8	**Polychlorinated terphenyls**	1.1E-01	ca	3.8E-01	ca	1.5E-03	ca	1.5E-02	ca		
									0.13		Polynuclear aromatic hydrocarbons (PAHs)										
		6.0E-02	i			6.0E-02	r	1		83-32-9	Acenaphthene	3.7E+03	nc	2.9E+04	nc	2.2E+02	nc	3.7E+02	nc	5.7E+02	2.9E+01
		3.0E-01	i			3.0E-01	r	1		120-12-7	Anthracene	2.2E+04	nc	1.0E+05	max	1.1E+03	nc	1.8E+03	nc	1.2E+04	5.9E+02
7.3E-01	n			7.3E-01	r			0	0.13	56-55-3	**Benz[a]anthracene**	6.2E-01	ca	2.1E+00	ca	9.2E-03	ca	9.2E-02	ca	2.0E+00	8.0E-02
7.3E-01	n			7.3E-01	r			0	0.13	205-99-2	**Benzo[b]fluoranthene**	6.2E-01	ca	2.1E+00	ca	9.2E-03	ca	9.2E-02	ca	5.0E+00	2.0E-01
7.3E-02	n			7.3E-02	r			0	0.13	207-08-9	**Benzo[k]fluoranthene**	6.2E+00	ca	2.1E+01	ca	9.2E-02	ca	9.2E-01	ca	4.9E+01	2.0E+00
1.2E+00				3.9E-01					0.13	207-08-9	**"CAL-Modified PRG"**	3.8E-01	ca	1.3E+00	ca	1.7E-02	ca	5.6E-02	ca		
7.3E+00	i			7.3E+00	r			0	0.13	50-32-8	**Benzo[a]pyrene**	6.2E-02	ca	2.1E-01	ca	9.2E-04	ca	9.2E-03	ca	8.0E+00	4.0E-01
7.3E-03	n			7.3E-03	r			0	0.13	218-01-9	**Chrysene**	6.2E+01	ca	2.1E+02	ca	9.2E-01	ca	9.2E+00	ca	1.6E+02	8.0E+00
1.2E-01				3.9E-02					0.13		**"CAL-Modified PRG"**	3.8E+00	ca	1.3E+01	ca	1.7E-01	ca	5.6E-01	ca		
7.3E+00	n			7.3E+00	r			0	0.13	53-70-3	**Dibenz[ah]anthracene**	6.2E-02	ca	2.1E-01	ca	9.2E-04	ca	9.2E-03	ca	2.0E+00	8.0E-02
		4.0E-02	i			4.0E-02	r	0	0.13	206-44-0	Fluoranthene	2.3E+03	nc	2.2E+04	nc	1.5E+02	nc	1.5E+03	nc	4.3E+03	2.1E+02
		4.0E-02	i			4.0E-02	r	1		86-73-7	Fluorene	2.7E+03	nc	2.6E+04	nc	1.5E+02	nc	2.4E+02	nc	5.6E+02	2.8E+01
7.3E-01	n			7.3E-01	r			0	0.13	193-39-5	**Indeno[1,2,3-cd]pyrene**	6.2E-01	ca	2.1E+00	ca	9.2E-03	ca	9.2E-02	ca	1.4E+01	7.0E-01
		2.0E-02	i			8.6E-04	i	1		91-20-3	Naphthalene	5.6E+01	nc	1.9E+02	nc	3.1E+00	nc	6.2E+00	nc	8.4E+01	4.0E+00
		3.0E-02	i			3.0E-02	r	1		129-00-0	Pyrene	2.3E+03	nc	2.9E+04	nc	1.1E+02	nc	1.8E+02	nc	4.2E+03	2.1E+02
1.5E-01	i	9.0E-03	i	1.5E-01	r	9.0E-03	r	0	0.10	67747-09-5	Prochloraz	3.2E+00	ca	1.1E+01	ca	4.5E-02	ca	4.5E-01	ca		
		6.0E-03	h			6.0E-03	r	0	0.10	26399-36-0	Profluralin	3.7E+02	nc	3.7E+03	nc	2.2E+01	nc	2.2E+02	nc		
		1.5E-02	i			1.5E-02	r	0	0.10	1610-18-0	Prometon	9.2E+02	nc	9.2E+03	nc	5.5E+01	nc	5.5E+02	nc		
		4.0E-03	i			4.0E-03	r	0	0.10	7287-19-6	Prometryn	2.4E+02	nc	2.5E+03	nc	1.5E+01	nc	1.5E+02	nc		
		7.5E-02	i			7.5E-02	r	0	0.10	23950-58-5	Pronamide	4.6E+03	nc	4.6E+04	nc	2.7E+02	nc	2.7E+03	nc		
		1.3E-02	i			1.3E-02	r	0	0.10	1918-16-7	Propachlor	7.9E+02	nc	8.0E+03	nc	4.7E+01	nc	4.7E+02	nc		
		5.0E-03	i			5.0E-03	r	0	0.10	709-98-8	Propanil	3.1E+02	nc	3.1E+03	nc	1.8E+01	nc	1.8E+02	nc		
		2.0E-02	i			2.0E-02	r	0	0.10	2312-35-8	Propargite	1.2E+03	nc	1.2E+04	nc	7.3E+01	nc	7.3E+02	nc		
		2.0E-03	i			2.0E-03	r	0	0.10	107-19-7	Propargyl alcohol	1.2E+02	nc	1.2E+03	nc	7.3E+00	nc	7.3E+01	nc		
		2.0E-02	i			2.0E-02	r	0	0.10	139-40-2	Propazine	1.2E+03	nc	1.2E+04	nc	7.3E+01	nc	7.3E+02	nc		
		2.0E-02	i			2.0E-02	r	0	0.10	122-42-9	Propham	1.2E+03	nc	1.2E+04	nc	7.3E+01	nc	7.3E+02	nc		
		1.3E-02	i			1.3E-02	r	0	0.10	60207-90-1	Propiconazole	7.9E+02	nc	8.0E+03	nc	4.7E+01	nc	4.7E+02	nc		
		4.00E-02	n			4.00E-02	r	1		103-65-1	**n-Propylbenzene**	2.4E+02	sat	2.4E+02	sat	1.5E+02	nc	2.4E+02	nc		
		5.0E-01	h			8.6E-04	h	0	0.10	57-55-6	**Propylene glycol**	3.0E+04	nc	1.0E+05	max	3.1E+00	nc	1.8E+04	nc		
		7.0E-01	h			7.0E-01	r	0	0.10	52125-53-8	Propylene glycol, monoethyl ether	4.3E+04	nc	1.0E+05	max	2.6E+03	nc	2.6E+04	nc		
		7.0E-01	h			5.7E-01	i	0	0.10	107-98-2	Propylene glycol, monomethyl ether	4.3E+04	nc	1.0E+05	max	2.1E+03	nc	2.6E+04	nc		
2.4E-01	i	8.6E-03	r	1.3E-02	i	8.6E-03	i	1		75-56-9	Propylene oxide	1.9E+00	ca*	6.6E+00	ca*	5.2E-01	ca*	2.2E-01	ca		

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TOXICITY INFORMATION										CONTAMINANT	PRELIMINARY REMEDIAL GOALS (PRGs) "Direct Contact Exposure Pathways"								SOIL SCREENING LEVELS "Migration to Ground Water"	
SFo 1/(mg/kg-d)		RfDo (mg/kg-d)		SFi 1/(mg/kg-d)		RfDi (mg/kg-d)		VOC	skin abs. soils	CAS No.		Residential Soil (mg/kg)		Industrial Soil (mg/kg)		Ambient Air (ug/m^3)		Tap Water (ug/l)		DAF 20 (mg/kg)	DAF 1 (mg/kg)
		2.5E-01	i			2.5E-01	r	0	0.10	81335-77-5	Pursuit	1.5E+04	nc	1.0E+05	max	9.1E+02	nc	9.1E+03	nc		
		2.5E-02	i			2.5E-02	r	0	0.10	51630-58-1	Pydrin	1.5E+03	nc	1.5E+04	nc	9.1E+01	nc	9.1E+02	nc		
		1.0E-03	i			1.0E-03	r	0	0.10	110-86-1	Pyridine	6.1E+01	nc	6.2E+02	nc	3.7E+00	nc	3.6E+01	nc		
		5.0E-04	i			5.0E-04	r	0	0.10	13593-03-8	Quinalphos	3.1E+01	nc	3.1E+02	nc	1.8E+00	nc	1.8E+01	nc		
3.0E+00	i			3.0E+00	r			0	0.10	91-22-5	**Quinoline**	1.6E-01	ca	5.7E-01	ca	2.2E-03	ca	2.2E-02	ca		
1.1E-01	i	3.0E-03	i	1.1E-01	r	3.0E-03	r	0	0.10	121-82-4	RDX (Cyclonite)	4.4E+00	ca*	1.6E+01	ca	6.1E-02	ca	6.1E-01	ca		
		3.0E-02	i			3.0E-02	r	0	0.10	10453-86-8	Resmethrin	1.8E+03	nc	1.8E+04	nc	1.1E+02	nc	1.1E+03	nc		
		5.0E-02	h			5.0E-02	r	0	0.10	299-84-3	Ronnel	3.1E+03	nc	3.1E+04	nc	1.8E+02	nc	1.8E+03	nc		
		4.0E-03	i			4.0E-03	r	0	0.10	83-79-4	Rotenone	2.4E+02	nc	2.5E+03	nc	1.5E+01	nc	1.5E+02	nc		
		2.5E-02	i			2.5E-02	r	0	0.10	78587-05-0	Savey	1.5E+03	nc	1.5E+04	nc	9.1E+01	nc	9.1E+02	nc		
		5.0E-03	i					0	0.10	7783-00-8	Selenious Acid	3.1E+02	nc	3.1E+03	nc			1.8E+02	nc		
		5.0E-03	i					0		7782-49-2	Selenium	3.9E+02	nc	5.1E+03	nc			1.8E+02	nc	5.0E+00	3.0E-01
		5.0E-03	h					0	0.10	630-10-4	Selenourea	3.1E+02	nc	3.1E+03	nc			1.8E+02	nc		
		9.0E-02	i			9.0E-02	r	0	0.10	74051-80-2	Sethoxydim	5.5E+03	nc	5.5E+04	nc	3.3E+02	nc	3.3E+03	nc		
		5.0E-03	i					0		7440-22-4	Silver and compounds	3.9E+02	nc	5.1E+03	nc			1.8E+02	nc	3.4E+01	2.0E+00
1.2E-01	h	5.0E-03	i	1.2E-01	r	2.0E-03	r	0	0.10	122-34-9	Simazine	4.1E+00	ca*	1.4E+01	ca	5.6E-02	ca	5.6E-01	ca		
		4.0E-03	i							26628-22-8	Sodium azide										
2.7E-01	h	3.0E-02	i	2.7E-01	r	3.0E-02	r	0	0.10	148-18-5	Sodium diethyldithiocarbamate	1.8E+00	ca	6.4E+00	ca	2.5E-02	ca	2.5E-01	ca		
		2.0E-05	i			2.0E-05	r	0	0.10	62-74-8	Sodium fluoroacetate	1.2E+00	nc	1.2E+01	nc	7.3E-02	nc	7.3E-01	nc		
		1.0E-03	h			1.0E-03	r	0	0.10	13718-26-8	Sodium metavanadate	6.1E+01	nc	6.2E+02	nc	3.7E+00	nc	3.6E+01	nc		
		6.0E-01	i					0		7440-24-6	Strontium, stable	4.7E+04	nc	1.0E+05	max			2.2E+04	nc		
		3.0E-04	i			3.0E-04	r	0	0.10	57-24-9	Strychnine	1.8E+01	nc	1.8E+02	nc	1.1E+00	nc	1.1E+01	nc		
		2.0E-01	i			2.9E-01	i	1		100-42-5	Styrene	1.7E+03	sat	1.7E+03	sat	1.1E+03	nc	1.6E+03	nc	4.0E+00	2.0E-01
		1.00E-03	n			1.00E-03	r			80-07-9	1,1'-Sulfonylbis (4-chlorobenzene)	7.8E+01	nc	1.0E+03	nc	3.7E+00	nc	3.6E+01	nc		
		2.5E-02	i			2.5E-02	r	0	0.10	88671-89-0	Systhane	1.5E+03	nc	1.5E+04	nc	9.1E+01	nc	9.1E+02	nc		
1.5E+05	h			1.5E+05	h			0	0.03	1746-01-6	2,3,7,8-TCDD (dioxin)	3.9E-06	ca	1.6E-05	ca	4.5E-08	ca	4.5E-07	ca		
		7.0E-02	i			7.0E-02	r	0	0.10	34014-18-1	Tebuthiuron	4.3E+03	nc	4.3E+04	nc	2.6E+02	nc	2.6E+03	nc		
		2.0E-02	h			2.0E-02	r	0	0.10	3383-96-8	Temephos	1.2E+03	nc	1.2E+04	nc	7.3E+01	nc	7.3E+02	nc		
		1.3E-02	i			1.3E-02	r	0	0.10	5902-51-2	Terbacil	7.9E+02	nc	8.0E+03	nc	4.7E+01	nc	4.7E+02	nc		
		2.5E-05	h			2.5E-05	r	0	0.10	13071-79-9	Terbufos	1.5E+00	nc	1.5E+01	nc	9.1E-02	nc	9.1E-01	nc		
		1.0E-03	i			1.0E-03	r	0	0.10	886-50-0	Terbutryn	6.1E+01	nc	6.2E+02	nc	3.7E+00	nc	3.6E+01	nc		
		3.0E-04	i			3.0E-04	r	0	0.10	95-94-3	1,2,4,5-Tetrachlorobenzene	1.8E+01	nc	1.8E+02	nc	1.1E+00	nc	1.1E+01	nc		
2.6E-02	i	3.0E-02	i	2.6E-02	i	3.0E-02	r	1		630-20-6	1,1,1,2-Tetrachloroethane	3.2E+00	ca	7.3E+00	ca	2.6E-01	ca	4.3E-01	ca		
2.0E-01	i	6.00E-02	n	2.0E-01	i	6.00E-02	r	1		79-34-5	1,1,2,2-Tetrachloroethane	4.1E-01	ca	9.3E-01	ca	3.3E-02	ca	5.5E-02	ca	3.0E-03	2.0E-04
5.2E-02	n	1.0E-02	i	1.00E-02	n	1.7E-01	n	1		127-18-4	**Tetrachloroethylene (PCE)**	1.5E+00	ca*	3.4E+00	ca*	6.7E-01	ca	6.6E-01	ca	6.0E-02	3.0E-03
		3.0E-02	i			3.0E-02	r	0	0.10	58-90-2	2,3,4,6-Tetrachlorophenol	1.8E+03	nc	1.8E+04	nc	1.1E+02	nc	1.1E+03	nc		

Key : SFo,i=Cancer Slope Factor oral, inhalation RfDo,i=Reference Dose oral, inhalation i=IRIS h=HEAST n=NCEA x=Withdrawn o=Other EPA Source r=Route-extrapolation ca=Cancer PRG nc=Noncancer PRG ca* (where: nc < 100X ca) ca**(where: nc < 10X ca)
+++=Non-Standard Method Applied (See Section 2.3 of the "Region 9 PRGs Table User's Guide") sat=Soil Saturation (See Section 4.5) max=Ceiling limit (See Section 2.1) DAF=Dilution Attenuation Factor (See Section 2.5) CAS=Chemical Abstract Services

TOXICITY INFORMATION										CONTAMINANT	PRELIMINARY REMEDIAL GOALS (PRGs) "Direct Contact Exposure Pathways"								SOIL SCREENING LEVELS "Migration to Ground Water"	
SFo 1/(mg/kg-d)		RfDo (mg/kg-d)		SFi 1/(mg/kg-d)		RfDi (mg/kg-d)		VOC	skin abs. soils	CAS No.		Residential Soil (mg/kg)		Industrial Soil (mg/kg)		Ambient Air (ug/m^3)		Tap Water (ug/l)		DAF 20 (mg/kg)	DAF 1 (mg/kg)
2.0E+01	h			2.0E+01	r			0	0.10	5216-25-1	p,a,a,a-Tetrachlorotoluene	2.4E-02	ca	8.6E-02	ca	3.4E-04	ca	3.4E-03	ca		
2.4E-02	h	3.0E-02	i	2.4E-02	r	3.0E-02	r	0	0.10	961-11-5	Tetrachlorovinphos	2.0E+01	ca*	7.2E+01	ca	2.8E-01	ca	2.8E+00	ca		
		5.0E-04	i			5.0E-04	r	0	0.10	3689-24-5	Tetraethyldithiopyrophosphate	3.1E+01	nc	3.1E+02	nc	1.8E+00	nc	1.8E+01	nc		
7.6E-03	n	2.1E-01	n	6.8E-03	n	8.6E-02	n	1		109-99-9	**Tetrahydrofuran**	9.4E+00	ca	2.1E+01	ca	9.9E-01	ca	1.6E+00	ca		
		6.6E-05	i					0		7440-28-0	Thallium and compounds+++	5.2E+00	nc	6.7E+01	nc			2.4E+00	nc		
		1.0E-02	i			1.0E-02	r	0	0.10	28249-77-6	Thiobencarb	6.1E+02	nc	6.2E+03	nc	3.7E+01	nc	3.6E+02	nc		
		5.0E-02	n			5.0E-02	r	0	0.10	N/A	**Thiocyanate**	3.1E+03	nc	1.0E+05	max	1.8E+02	nc	1.8E+03	nc		
		3.0E-04	h			3.0E-04	r	0	0.10	39196-18-4	Thiofanox	1.8E+01	nc	1.8E+02	nc	1.1E+00	nc	1.1E+01	nc		
		8.0E-02	i			8.0E-02	r	0	0.10	23564-05-8	Thiophanate-methyl	4.9E+03	nc	4.9E+04	nc	2.9E+02	nc	2.9E+03	nc		
		5.0E-03	i			5.0E-03	r	0	0.10	137-26-8	Thiram	3.1E+02	nc	3.1E+03	nc	1.8E+01	nc	1.8E+02	nc		
		6.0E-01	h					0			Tin (inorganic, see tributyltin oxide for organic tin)	4.7E+04	nc	1.0E+05	max			2.2E+04	nc		
		2.0E-01	i			1.1E-01	i	1		108-88-3	Toluene	5.2E+02	sat	5.2E+02	sat	4.0E+02	nc	7.2E+02	nc	1.2E+01	6.0E-01
3.2E+00	h			3.2E+00	r			0	0.10	95-80-7	Toluene-2,4-diamine	1.5E-01	ca	5.4E-01	ca	2.1E-03	ca	2.1E-02	ca		
		6.0E-01	h			6.0E-01	r	0	0.10	95-70-5	Toluene-2,5-diamine	3.7E+04	nc	1.0E+05	max	2.2E+03	nc	2.2E+04	nc		
		2.0E-01	h			2.0E-01	r	0	0.10	823-40-5	Toluene-2,6-diamine	1.2E+04	nc	1.0E+05	max	7.3E+02	nc	7.3E+03	nc		
2E-01	i			2E-01	r			0	0.10	106-49-0	p-Toluidine	2.6E+00	ca	9.1E+00	ca	3.5E-02	ca	3.5E-01	ca		
1.1E+00	i			1.1E+00	i			0	0.10	8001-35-2	Toxaphene	4.4E-01	ca	1.6E+00	ca	6.0E-03	ca	6.1E-02	ca	3.1E+01	2.0E+00
		7.5E-03	i			7.5E-03	r	0	0.10	66841-25-6	Tralomethrin	4.6E+02	nc	4.6E+03	nc	2.7E+01	nc	2.7E+02	nc		
		1.3E-02	i			1.3E-02	r	0	0.10	2303-17-5	Triallate	7.9E+02	nc	8.0E+03	nc	4.7E+01	nc	4.7E+02	nc		
		1.0E-02	i			1.0E-02	r	0	0.10	82097-50-5	Triasulfuron	6.1E+02	nc	6.2E+03	nc	3.7E+01	nc	3.6E+02	nc		
		5.0E-03	i			5.0E-03	r	0	0.10	615-54-3	1,2,4-Tribromobenzene	3.1E+02	nc	3.1E+03	nc	1.8E+01	nc	1.8E+02	nc		
		3.0E-04	i					0	0.10	56-35-9	Tributyltin oxide (TBTO)	1.8E+01	nc	1.8E+02	nc			1.1E+01	nc		
3.4E-02	h			3.4E-02	r			0	0.10	634-93-5	2,4,6-Trichloroaniline	1.4E+01	ca	5.1E+01	ca	2.0E-01	ca	2.0E+00	ca		
2.9E-02	h			2.9E-02	r			0	0.10	33663-50-2	2,4,6-Trichloroaniline hydrochloride	1.7E+01	ca	5.9E+01	ca	2.3E-01	ca	2.3E+00	ca		
		1.0E-02	i			5.7E-02	h	1		120-82-1	1,2,4-Trichlorobenzene	6.5E+02	nc	3.0E+03	sat	2.1E+02	nc	1.9E+02	nc	5.0E+00	3.0E-01
		2.8E-01	n			6.3E-01	n	1		71-55-6	**1,1,1-Trichloroethane**	1.2E+03	sat	1.2E+03	sat	2.3E+03	nc	3.2E+03	nc	2.0E+00	1.0E-01
5.7E-02	i	4.0E-03	i	5.6E-02	i	4.0E-03	r	1		79-00-5	1,1,2-Trichloroethane	7.3E-01	ca*	1.6E+00	ca*	1.2E-01	ca	2.0E-01	ca	2.0E-02	9.0E-04
4.00E-01	n	3.00E-04	n	4.00E-01	n	1.00E-02	n	1		79-01-6	**Trichloroethylene (TCE)**	5.3E-02	ca	1.1E-01	ca	1.7E-02	ca	2.8E-02	ca	6.0E-02	3.0E-03
		3.0E-01	i			2.0E-01	h	1		75-69-4	Trichlorofluoromethane	3.9E+02	nc	2.0E+03	sat	7.3E+02	nc	1.3E+03	nc		
		1.0E-01	i			1.0E-01	r	0	0.10	95-95-4	2,4,5-Trichlorophenol	6.1E+03	nc	6.2E+04	nc	3.7E+02	nc	3.6E+03	nc	2.7E+02	1.4E+01
1.1E-02	i	1.0E-04	n	1.1E-02	i	1.0E-04	r	0	0.10	88-06-2	**2,4,6-Trichlorophenol**	6.1E+00	nc**	6.2E+01	nc**	3.7E-01	nc**	3.6E+00	nc**	2.0E-01	8.0E-03
7.0E-02				7.0E-02					0.10	88-06-2	**"CAL-Modified PRG"**	6.9E+00	ca	2.5E+01	ca	9.6E-02	ca	9.6E-01	ca		
		1.0E-02	i			1.0E-02	r	0	0.10	93-76-5	2,4,5-Trichlorophenoxyacetic Acid	6.1E+02	nc	6.2E+03	nc	3.7E+01	nc	3.6E+02	nc		
		8.0E-03	i			8.0E-03	r	0	0.10	93-72-1	2-(2,4,5-Trichlorophenoxy) propionic acid	4.9E+02	nc	4.9E+03	nc	2.9E+01	nc	2.9E+02	nc		
		5.0E-03	i			5.0E-03	r	1		598-77-6	1,1,2-Trichloropropane	1.5E+01	nc	5.1E+01	nc	1.8E+01	nc	3.0E+01	nc		
2.0E+00	n	6.0E-03	i	2.0E+00	r	1.4E-03	n	1		96-18-4	**1,2,3-Trichloropropane**	5.0E-03	ca	1.1E-02	ca	3.4E-03	ca	5.6E-03	ca		

Key : SFo,i=Cancer Slope Factor oral, inhalation RfDo,i=Reference Dose oral, inhalation i=IRIS h=HEAST n=NCEA x=Withdrawn o=Other EPA Source r=Route-extrapolation ca=Cancer PRG nc=Noncancer PRG ca* (where: nc < 100X ca) ca**(where: nc < 10X ca)
+++=Non-Standard Method Applied (See Section 2.3 of the "Region 9 PRGs Table User's Guide") sat=Soil Saturation (See Section 4.5) max=Ceiling limit (See Section 2.1) DAF=Dilution Attenuation Factor (See Section 2.5) CAS=Chemical Abstract Services

TOXICITY INFORMATION										CONTAMINANT	PRELIMINARY REMEDIAL GOALS (PRGs) "Direct Contact Exposure Pathways"								SOIL SCREENING LEVELS "Migration to Ground Water"	
SFo 1/(mg/kg-d)		RfDo (mg/kg-d)		SFi 1/(mg/kg-d)		RfDi (mg/kg-d)		VOC	skin abs. soils	CAS No.		Residential Soil (mg/kg)		Industrial Soil (mg/kg)		Ambient Air (ug/m^3)		Tap Water (ug/l)		DAF 20 (mg/kg)	DAF 1 (mg/kg)
		5.0E-03	h			5.0E-03	r	1		96-19-5	1,2,3-Trichloropropene	1.2E+01	nc	3.8E+01	nc	1.8E+01	nc	3.0E+01	nc		
		3.0E-03	i			3.0E-03	r	0	0.10	58138-08-2	Tridiphane	1.8E+02	nc	1.8E+03	nc	1.1E+01	nc	1.1E+02	nc		
		2.0E-03	r			2.0E-03	i	1		121-44-8	Triethylamine	2.3E+01	nc	8.6E+01	nc	7.3E+00	nc	1.2E+01	nc		
7.7E-03	i	7.5E-03	i	7.7E-03	r	7.5E-03	r	0	0.10	1582-09-8	Trifluralin	6.3E+01	ca**	2.2E+02	ca*	8.7E-01	ca*	8.7E+00	ca*		
		1.400E-04	r			1.400E-04	n		0.10	552-30-7	Trimellitic Anhydride (TMAN)	8.6E+00	nc	8.6E+01	nc	5.1E-01	nc	5.1E+00			
		5.0E-02	n			1.7E-03	n	1		95-63-6	1,2,4-Trimethylbenzene	5.2E+01	nc	1.7E+02	nc	6.2E+00	nc	1.2E+01	nc		
		5.0E-02	n			1.7E-03	n	1		108-67-8	1,3,5-Trimethylbenzene	2.1E+01	nc	7.0E+01	nc	6.2E+00	nc	1.2E+01	nc		
3.7E-02	h			3.7E-02	r			0	0.10	512-56-1	Trimethyl phosphate	1.3E+01	ca	4.7E+01	ca	1.8E-01	ca	1.8E+00	ca		
		3.0E-02	i			3.0E-02	r	0	0.10	99-35-4	1,3,5-Trinitrobenzene	1.8E+03	nc	1.8E+04	nc	1.1E+02	nc	1.1E+03	nc		
		1.0E-02	h			1.0E-02	r	0	0.10	479-45-8	Trinitrophenylmethylnitramine	6.1E+02	nc	6.2E+03	nc	3.7E+01	nc	3.6E+02	nc		
3E-02	i	5.0E-04	i	3E-02	r	5.0E-04	r	0	0.10	118-96-7	2,4,6-Trinitrotoluene	1.6E+01	ca**	5.7E+01	ca**	2.2E-01	ca**	2.2E+00	ca**		
		5.00E-03	n			5.00E-03	r		0.10	791-28-6	**Triphenylphosphine oxide**	3.1E+02	nc	3.1E+03	nc	1.8E+01	nc	1.8E+02	nc		
3.2E-03	n	1.1E-01	n	3.2E-03	r	1.1E-01	r		0.10	115-96-8	**Tris(2-chloroethyl) phosphate**	1.5E+02	ca*	5.4E+02	ca	2.1E+00	ca	2.1E+01	ca		
		2.00E-04	n							7440-61-0	Uranium (chemical toxicity only)	1.6E+01	nc	2.0E+02	nc			7.3E+00	nc		
		7.0E-03	h					0		7440-62-2	Vanadium and compounds	5.5E+02	nc	7.2E+03	nc			2.6E+02	nc	6.0E+03	3.0E+02
		1.0E-03	i			1.0E-03	r	0	0.10	1929-77-7	Vernam	6.1E+01	nc	6.2E+02	nc	3.7E+00	nc	3.6E+01	nc		
		2.5E-02	i			2.5E-02	r	0	0.10	50471-44-8	Vinclozolin	1.5E+03	nc	1.5E+04	nc	9.1E+01	nc	9.1E+02	nc		
		1.0E+00	h			5.7E-02	i	1		108-05-4	Vinyl acetate	4.3E+02	nc	1.4E+03	nc	2.1E+02	nc	4.1E+02	nc	1.7E+02	8.0E+00
1.1E-01	r	8.6E-04	r	1.1E-01	h	8.6E-04	i	1		593-60-2	Vinyl bromide (bromoethene)	1.9E-01	ca*	4.2E-01	ca*	6.1E-02	ca*	1.0E-01	ca*		
1.5E+00	i	3.00E-03	i	3.1E-02	i	2.86E-02	i	1		75-01-4	**Vinyl chloride (child/adult)+++**	7.9E-02	ca			1.1E-01	ca	2.0E-02	ca	1.0E-02	7.0E-04
7.5E-01	i	3.00E-03	i	1.6E-02	i	2.86E-02	i	1		75-01-4	Vinyl chloride (adult)			7.5E-01	ca						
		3.0E-04	i			3.0E-04	r	0	0.10	81-81-2	Warfarin	1.8E+01	nc	1.8E+02	nc	1.1E+00	nc	1.1E+01	nc		
		7.0E-01	i			2.9E-02	i	1	0.10	1330-20-7	**Xylenes**	2.7E+02	nc	4.2E+02	sat	1.1E+02	nc	2.1E+02	nc	2.1E+02	1.0E+01
		3.0E-01	i					0		7440-66-6	Zinc	2.3E+04	nc	1.0E+05	max			1.1E+04	nc	1.2E+04	6.2E+02
		3.0E-04	i					0		1314-84-7	Zinc phosphide	2.3E+01	nc	3.1E+02	nc			1.1E+01	nc		
		5.0E-02	i			5.0E-02	r	0	0.10	12122-67-7	Zineb	3.1E+03	nc	3.1E+04	nc	1.8E+02	nc	1.8E+03	nc		

Appendix L

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7.2 Calculation of Chemical Cancer Risks and Non-Cancer Hazards. Receptor Age: Youth
7.3 Calculation of Chemical Cancer Risks and Non-Cancer Hazards. Receptor Age: Child. Receptor Population: Recreational
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7.4 Supplement: Calculation of DAevent
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Attachment 2

Technical Memorandum: Review of "Contaminant Levels in Crabs from Two Solid Waste Management Units on Vieques National Wildlife Refuse."

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APPENDIX L

Human Health and Ecological Risk Assessments

A human health and ecological risk assessment was conducted for SWMU 6, as proposed in the work plan (CH2M HILL, 2003). The data used for this risk assessment are presented in Section 4, and the fate and transport of the detected chemicals are discussed in Section 5.

It is important to emphasize that the risk assessment conclusions drawn in herein are based on the data discussed in Section 4. As noted previously, there is recognized uncertainty associated with the number, type, and concentrations of soil contaminants at the site because soil samples were generally collected adjacent to the waste piles, rather than directly through them, due to safety concerns. This may have resulted in an underestimation of the soil contaminant levels and, therefore, the potential risks posed by the contamination. While the results of the HHRA and ERA summarized herein are appropriate for the data collected, the level of uncertainty associated with the HHRA and ERA conclusions as they relate to the site as a whole (i.e., including the waste piles themselves) warrants action to address the uncertainty. It is the planned removal action, and its associated waste characterization and confirmatory sampling protocol, that will appropriately address this uncertainty. Additionally, the removal action will address the waste as a potential future source of contamination.

It is also important to note that since the HHRA and ERA were performed for the draft report, some information utilized in the risk assessments may have changed, and more will change as a result of the planned removal action. For example, published toxicity values and other health-based criteria for various chemicals have been modified. Another example is that specifics about the future land use have become known. In late 2006, the DOI issued the Draft Comprehensive Conservation Plan for Vieques, which provides details of planned land uses. In order to efficiently focus resources to achieve timely removal of the waste at SWMU 6 and confirm residual media concentrations are protective of human health and the environment, the HHRA and ERA in this report has been finalized as originally presented in draft form, rather than modified with the updated information, because new site data will be collected as part of the removal action and a new risk assessment performed. This new risk assessment will incorporate new information about future land uses and the most up-to-date risk-based criteria. Further, the new risk assessment will be performed in accordance with the HHRA and ERA protocols in the Master Quality Assurance Project Plan (CH2M HILL, May 2006), refined as applicable in accordance with regulatory agency comments.

L.1 Baseline Human Health Risk Assessment

A baseline risk assessment was conducted for SWMU 6. The baseline risk assessment refers to the risks characterized under "as is" conditions, based on the assumption that no remedial actions are conducted for the current and potential future land use. The HHRA

evaluated potential risks and hazards that could result from exposures to site media including soil, sediment, surface water, and groundwater at SWMU 6. The analytical data used for the risk evaluation were collected during the previous studies, including an Expanded PA/SI (CH2M HILL, 2000d) and the RI. The assumptions used for the quantitative exposure and risk estimations are conservative and are the same as those presented in the work plan (CH2M HILL, 2003b) and previous risk assessment reports for other sites (CH2M HILL, 2003b). All the potential exposure pathways were considered during the risk assessment, and future residential land use was conservatively assumed for SWMU 6. However, the swamplike conditions across most of the site and the periodic flooding of its surface by seawater likely preclude its use as a residential site. A future residential exposure scenario was included for conservative comparison with other exposure scenarios. Inorganic chemicals detected in site media were retained for risk estimation, although they could reflect background conditions.

The risk assessment is in accordance with the pertinent EPA guidance, most of which is included in the documents listed below.

EPA, 1989. *Risk Assessment Guidance for Superfund (RAGS), Volume 1, Human Health Evaluation Manual (Part A)*. EPA/540/1-89/002.

EPA, 1990. *Guidance for Data Usability in Risk Assessment*. EPA/540/G-90/008.

EPA, 1991. *Risk Assessment Guidance for Superfund, Volume I, Human Health Evaluation Manual, Supplemental Guidance: "Standard Default Exposure Factors."* OSWER Directive 9285.6-03.

EPA, 1997. *Exposure Factors Handbook*. EPA/600/P-95/002Fa.

EPA, 2001. *Risk Assessment Guidance for Superfund (RAGS).* Volume I*: Human Health Evaluation Manual* (Part E, *Supplemental Guidance for Dermal Risk Assessment*). Interim.

EPA, 2001. *Risk Assessment Guidance for Superfund (RAGS).* Volume I: *Human Health Evaluation Manual* (Part D, *Standardized Planning, Reporting and Review of Superfund Risk Assessments*). Final. December.

The risk assessment was presented in the RAGS Part D format to ensure consistent documentation of the risk calculation process and input assumptions, as requested by the EPA and PREQB during their review of an earlier report (CH2M HILL, 2003). The site-specific risk assessment tables, provided in RAGS Part D format, are included as Attachment 1 of this appendix.

L.1.2 Conceptual Site Exposure Model

A complete discussion on fate and transport pathways and the CSM is presented in Section 5. The CSM qualitatively defines the various contaminant sources, release mechanisms, migration, and persistence of contaminants in the media at the site. Based on the available site information, a flow chart of the potential migration pathways, exposure pathways, potential human receptors, and ecological receptors was prepared and is shown on Figure 5-1; a graphic presentation of the CSM is shown on Figure 5-2.

SWMU 6 is located in an oceanside mangrove wetlands near Kiani Lagoon along Highway 200 on the former NASD (Figures 2-3 and 2-4). SWMU 6 has a bioluminescent water body (a bay) to the west and north and a canal to the east. SWMU 6 is separated from both of these water bodies by a berm that may have been built during SWMU 6 use in the past. The site was used for disposal of solid waste from past Navy operations within the former NASD. Waste materials extend approximately 100 feet to 120 feet north-northeast of Highway 200 from the east side of the Kiani Lagoon Bridge. Materials discarded at this site included metal and glass containers as well as general rubble. A CH2M HILL inspection in conjunction with an MEC avoidance team (CH2M HILL, 2000) also identified ordnance items and solid waste from the base galley. The disposal activities occurred from the early 1960s to the late 1970s. The area where waste is located covers about 1 acre.

A transport pathway describes the mechanisms whereby chemicals detected in a site medium may be transported from a source of contamination to potential exposure media. The migration potential is based on location of the site, type of chemicals, and media in which the contamination is present. These transport pathways are shown in Figures 5-1 and 5-2. Metal items are corroded and have been degraded into small pieces throughout the disposal area. It is likely that portions of these degrading metallic objects have been transported into sediments and water. Both suspended particles in sediments and dissolved metals in surface water could migrate though runoff into adjacent water bodies located to the west and east of the site, eventually releasing to the ocean. The site is a habitat for several species of crabs.

The groundwater at the site is generally near the land surface. The groundwater is tidally influenced and is well connected with the surface water (Figure 2-6). Groundwater at SWMU 6 exists under unconfined conditions. The depth to groundwater is approximately 1 to 2 feet bgs. Groundwater elevations show a lower head potential than the surface water. Based on the high estimated total dissolved solids (TDS) levels ranging between 35,854 and 53,475 mg/L levels in the groundwater and shallow depth to groundwater, surface water appears to mix and interact with the groundwater. The groundwater at the site is not potable due to high TDS, indicative of salinity.

There is no human activity (other than potentially trespassing), and most of the site is fenced off to prevent easy access; thus, human exposure pathways are currently incomplete. The site is located within the area transferred to the Department of the Interior (DOI), which plans to use this general area of the island as part of a nature trail. In the future, therefore, the site may have limited public access through guided and unguided tours. While the site itself will not be used by the DOI, the nature trail is planned to extend along Highway 200 in the vicinity of the site. Potential human receptors for the site are assumed to be current/future recreational visitors or trespassers, as well as workers involved in maintenance of the nature trails. As part of the conservative approach to risk assessment, several worker populations (maintenance workers, industrial workers, and construction workers) were evaluated. Although construction of office buildings or office buildings type of activities is not likely to occur in this area, this pathway was evaluated in case ground-disturbing activities are conducted at the site, exposing workers to subsurface soil. A residential land use is also assumed to estimate the worst-case exposure conditions, although it is highly unlikely that housing would be built in this wetland.

The exposure media evaluated for SWMU 6 were soils, sediment, surface water, and groundwater. Direct exposures to both surface and subsurface soils were evaluated. Subsurface soil exposures could occur to a construction worker if the site is developed and construction occurs in the area as part of future development. The site groundwater investigations indicated that the groundwater occurs at shallow depth and has high salt content, making it unsuitable for potable use. However, for conservative risk evaluation, groundwater was evaluated for potential future potable use. Exposure routes evaluated for all of the human receptors included ingestion, dermal contact, and inhalation exposure to soil, and ingestion and dermal contact with sediment, surface water, and groundwater. The exposure pathways, receptors, and routes are discussed further in the exposure assessment section.

L.1.3 Current and Future Land Use

Although the former NASD occupies approximately 8,000 acres, most of the area is undeveloped, and SWMU 6 is currently inactive. SWMU 6 and the surrounding area have been transferred to the DOI, and preliminary future land use plans for this area indicate that this area will be used for a nature trail and public education on island ecology, with no direct access to SWMU 6 itself. The site was evaluated for unlimited access, to offer most flexibility on future land use for the site if the risk assessment results indicate that site conditions are protective against potential human exposures.

L.1.4 Groundwater Conditions and Quality

The discussion of site groundwater quality from Sections 4 and 5 is summarized here to provide a perspective on whether the site groundwater qualifies as a potable water source. The lithology at SWMU 6 consists of silty sand with organic material, which is underlain by well-graded sand with crushed shells. Generally, the subsurface soil is in a loose matrix and is very permeable. Based on the hydraulic tidal study, the Kiani Lagoon North and Kiani Lagoon South stilling wells showed tidal fluctuations of approximately 0.7 foot and indicated a current flowing either north or south depending on the stage of the tidal cycle.

Groundwater at SWMU 6 exists under unconfined conditions. The depth to groundwater is approximately 1 to 2 feet bgs. Local groundwater flow is dependent on tidal fluctuations. During high tides, local groundwater flows to the southwest toward Kiani Lagoon South. During low tides, local groundwater flows to the northwest toward Kiani Lagoon North. This tidal influence on groundwater flow direction is expected to have an impact on the groundwater quality at the site. The groundwater at the western edge of the site has a salinity similar to that of sea water.

Based on an evaluation of field data collected during sampling events, the quality of SWMU 6 groundwater is not suitable for potable use due to high salinity and the presence of high levels of TDS as presented previously, which indicate high salinity.

Two monitoring wells, NDW07MW07 and NDW07MW08, were installed to the south and east of the site. The well locations are upgradient of the site and represent background conditions (see Figure 4-5). Therefore, these two wells were used to represent background conditions for the site.

L.1.5 Summary of Sample Collection and Analysis

Section 4 presents a detailed analysis of the various samples collected at SWMU 6. Analytical results are presented in Appendix I. Surface soil, sediment, surface water, and groundwater samples were collected as part of the Expanded PA/SI (CH2M HILL, 2000d), and additional samples were collected for all four media as part of the RI. Figures 4-1 through 4-9 present the sampling locations for surface soils, subsurface soils, and groundwater, as well as chemicals identified as exceeding the screening criteria during the preliminary screening discussed in Section 4. Some of the sediment and surface water sample locations from the Expanded PA/SI (CH2M HILL, 2000d) were resampled to determine if some of the earlier detected chemicals are still present at the site similar concentrations. New locations were also sampled to define the extent of previously detected chemicals.

A total of 23 surface soil samples and 8 subsurface soil samples were included for selection of COPCs in the HHRA.

As noted above, the groundwater at the site is close to the surface. Copies of the sampling logs and well boring logs for individual samples are included in Appendixes C through F. A total of 8 groundwater wells were used to collect 10 samples; two wells were sampled twice, once during the Expanded PA/SI in 2000 and once during the RI in 2003. A total of 10 groundwater samples were available for selection of COPCs for groundwater (Table L-2).

A total of 19 sediment samples and 14 surface water samples were available for use in the risk assessment. Five sediment sample locations from the Expanded PA/SI were resampled during the RI sampling effort (10 samples from 5 locations). In addition, 9 new locations were sampled, resulting in a total of 19 sediment samples used in this risk assessment. Two sediment samples were collected from stations NDW06SD15 and NDW06SD16 and were used to represent background conditions for SWMU 6.

L.1.5.1 COPC Selection for Human Health Risk Assessment

The maximum concentrations of detected chemicals were compared to the current EPA Region 9 screening criteria (EPA, 2002d) for each sampling matrix. Although several of the inorganic chemicals occur above preliminary remediation goals (PRGs) but below background concentrations, no chemicals were eliminated from the risk evaluation based on their occurrence at background levels; this decision is consistent with recommendations from the reviewing agencies. The final site recommendations were based on results of the human health and ecological risk assessments, and comparisons with the background levels as appropriate for the inorganic chemicals.

The sampled media include surface soils, subsurface soils, sediment, surface water, and groundwater. The following sources were used to obtain the health-based screening criteria:

Surface soil results were screened against human health direct exposure risk-based criteria for soils under residential land use from the EPA Region 9 PRG table (EPA, 2002d). Noncarcinogenic PRG values were reduced by a factor of 10 (Hazard Index [HI] = 0.1) to account for the potential presence of multiple chemicals.

Subsurface soil as deep as 10 feet bgs could be exposed during construction activities. Therefore, concentrations in soils down to this depth were compared against industrial PRG

values from Region 9 PRG table, and the COPCs selected were evaluated for a construction worker and a residential receptor (adult and child) exposure. Noncarcinogenic PRG values were reduced by a factor of 10 (Hazard Index [HI] = 0.1) to account for the potential presence of multiple chemicals.

Surface and subsurface soils were screened against soil-to-groundwater protection risk-based criteria, the generic Soil Screening Levels (SSLs) based on a dilution attenuation factor (DAF) of 10 from EPA's *Soil Screening Guidance: Technical Background Document* (1996). The chemicals exceeding SSL were addressed in Section 5. The chemicals exceeding SSL were not carried through as COPCs if they did not exceed the direct exposure-based PRGs.

Sediment sample maximum detected concentrations were compared against residential soil PRG values from Region 9 PRG table for COPC selection for a recreational scenario. Noncarcinogenic PRG values were reduced by a factor of 10 (H = 0.1) to account for the potential presence of multiple chemicals.

Surface water samples were compared against EPA Region 9 tap water PRGs, and exceedances were identified as COPCs for a recreational scenario. Noncarcinogenic PRG values were reduced by a factor of 10 (HI = 0.1) to account for the potential presence of multiple chemicals.

Groundwater samples were screened against Region 9 tap water PRG values for groundwater. Noncarcinogenic PRG values were reduced by a factor of 10 (HI = 0.1) to account for the potential presence of multiple chemicals.

Frequency of detection, concentration, site-related use or release, and the structural activity relationships available in the EPA guidance were taken into account in deciding whether to retain each chemical without a PRG for further consideration.

Constituents with concentrations below the PRGs were eliminated from further evaluation in the risk assessment. Constituents with concentrations above the PRGs were retained as COPCs. Tables L-1 through L-4 present the COPCs selected by comparing maximum detected concentrations in each medium against the screening criteria noted above. A more detailed listing of the COPC screening is presented in Table 2s in RAGS Part D format is presented in Attachment 1 of this appendix.

Table L-1 presents the COPCs identified for surface soil and subsurface soil at SMWU 6. In surface soil (Table L-1), several polycyclic aromatic hydrocarbons (PAHs) and metals were identified as COPCs. During site visits, several metal objects coated with asphalt material were noted at the site, which could be the source of the observed PAHs. All other COPCs were inorganic chemicals that could be from the metal objects discarded at SWMU 6. However, these metals also occur commonly in the background. For subsurface soils, only arsenic was identified as a COPC (Table L-1).

Table L-2 presents the COPCs selected for groundwater. Chloroform (NDS06MW01 and NDS06MW06), perchlorate (NDS06MW01), and two PCBs (NDS06MW04) were reported at concentrations above screening criteria and thus were selected as COPCs (Figure 4-5). However, resampling of NDS06MW04 did not indicate PCBs above detection limits. Perchlorate was reported above detection limits during the RI sampling in 2003 in NDS06MW01, located south of the main SWMU 6 and Highway 200 (Figure 4-6). This well

was resampled in February 2004, and perchlorate was not detected. The analytical methods for perchlorate are prone to result in false positives. Chloroform was reported at low concentrations but was also detected in blanks and is a common laboratory contaminant. All chemicals exceeding criteria, however, were included for risk assessment as COPCs.

Several inorganic chemicals were found to exceed the screening criteria and were therefore selected as COPCs. Among these inorganic COPCs, arsenic was detected in six site wells (NDS06MW01 to NDS06MW06) at concentrations ranging between 3.5 µg/L and 152 µg/L (Figure 4-5). Total and dissolved forms of arsenic were detected in the same wells. Site soil samples did not have elevated arsenic, indicating that site geochemical conditions may promote the presence of dissolved arsenic from the natural soil matrix. Such an occurrence is commonly observed in conducive reducing conditions such as those typically observed in wetland areas, as described in Section 5. The detected total arsenic was included as a COPC in the risk assessment for groundwater SWMU 6 for conservative risk analysis.

Tables L-3 and L-4 present the COPCs identified for sediments and surface water. Sediment samples from SWMU 6 had 1 PAH, benzo(a)pyrene and 11 inorganic chemicals identified as COPCs. Of these, a high level of arsenic (555 mg/kg) was detected from one sample (NDS06SD-02) collected on the edge of the surface water body west of the site near the SWMU 6 boundary. Resampling this location to determine the presence and extent of arsenic indicated arsenic levels to be much lower (1.3 mg/kg) during 2003 sampling. All of the detected arsenic levels were used in the risk assessment, including the historical maximum levels that could not be reproduced. In the surface water samples collected at the site, no organic chemicals and only four inorganic chemicals were identified as COPCs.

L.1.6 Exposure Assessment

An exposure assessment was performed to evaluate the potential exposure of the identified human receptors to the site media based on current and anticipated future land use for SWMU 6. The exposure assessment included potential exposure pathways for human receptors, potential routes of exposure, exposure factor assumptions, and estimated exposure concentrations.

L.1.7 Potentially Exposed Populations

The U.S. Navy ceased facility wide operations on the former NASD on April 30, 2001 and SWMU 6 is located in an areas transferred to DOI (see Figure L-1). Additional land transfer details are provided in Section 2.7 regarding the regulatory status of the site.

The former NASD is currently an inactive facility. The area that includes SWMU 6 is part of the property transferred to the DOI and is planned for future use as part of a nature trail with limited or no direct access to SWMU 6 itself. However, unrestricted land use was assumed for SWMU 6, to assess if land use restrictions need to maintained at the site. Based on the existing land use at SWMU 6, no human receptors are currently present. In accordance with anticipated future land use considerations, the following potentially exposed populations were identified:

Maintenance workers
Construction workers
Industrial workers

Recreational receptors (adult, youth, and child)
Residential receptors (adult and child)

Other potentially exposed populations could exist, though their exposures would likely be lower than exposures to the populations listed above. If these listed receptors are protected, all other potentially exposed populations will also be protected. Exposure assumptions were selected to be conservatively representative and thus estimate the possible upper-bound exposures by using the reasonable maximum exposure (RME) levels from the EPA guidance. In addition, when multiple exposure factors were available, the most conservative factor was selected to ensure conservatism in the exposure assessment. The exposure factors were selected from various sources including the following EPA guidance documents:

Human Health Evaluation Manual, Supplemental Guidance: "Standard Default Exposure Factors." OSWER Directive 9285.6-03. March 25, 1991.

Supplemental Guidance for Developing Soil Screening Levels for Superfund Sites, Peer Review Draft. OSWER 9355.4. March 24, 2001.

Exposure Factors Handbook, *Volume I.* May 1989.

Risk Assessment Guidance for Superfund (RAGS) Volume I: Human Health Evaluation Manual. Part E Supplemental Guidance for Dermal Risk Assessment, Interim Draft. September 2001.

Risk Assessment Guidance for Superfund (RAGS) Volume I: Human Health Evaluation Manual. Part A, Interim Final. December 1989.

The following subsections provide descriptions of the individual potentially exposed populations evaluated in this risk assessment. Table L-5 presents the exposure pathway and receptor summaries included in this risk assessment.

L.1.7.1 Maintenance Workers

Currently, there are no maintenance workers at SWMU 6, as no maintenance activities are occurring there. Therefore, this exposure pathway under current conditions is incomplete. In the future, activities may include mowing and facilities maintenance. Based on the likely occupational duties, it was assumed that maintenance workers would have the potential for direct or indirect contact with surface soils. The maintenance workers are not likely to contact site groundwater, as water is not accessible during routine maintenance activities. The site groundwater is not currently being used (i.e., pumped), and the activities assumed for a maintenance worker would not result in exposures to site groundwater. Therefore, the groundwater exposure pathway is incomplete for a maintenance worker and this pathway was not evaluated for the maintenance worker scenario. The exposure assumptions for this scenario include a maintenance activity occurring once a week (52 days/year), with the workers spending the entire workday on the site. The soil ingestion rate (IR), intake through dermal contact, and inhalation of dust-related exposure factors are included in tables in this appendix and include relevant details on these exposure assumptions.

L.1.7.2 Construction Workers

A future construction worker scenario was evaluated for subsurface soil exposure at SWMU 6. Typically, construction work is assumed to last for 6 months with an EF of 250 workdays per year, and an ED of 0.5 (6 months). The soil ingestion, dermal contact, and

inhalation rates for a construction worker are included in Table 4s of this appendix. The ingestion rate assumed is 330 mg/day, which is higher than for any other worker scenario. All other exposure factors are similar to those of an industrial worker scenario, as shown in the risk tables presented in Attachment 1 of this appendix.

Exposures to site groundwater could occur during construction activities due to the presence of groundwater at very shallow depths. Since most of the COPCs are inorganic chemicals, dose from dermal exposures to these chemicals are likely to be negligible; therefore, groundwater exposure to construction workers was not included for quantitative assessment.

L.1.7.3 Industrial Workers

This scenario was evaluated assuming that the site may be converted into a future industrial facility where a worker spends the entire workday at the site in direct contact with soils. This is a conservative assumption, considering this area is occasionally under water during exceptionally high tides and that the area is a wetlands. Site groundwater has high salinity and is not of potable quality. However it was assumed to be used for potable use in the future industrial use scenario. For risk management purposes, the site was evaluated for a future industrial land use.

Industrial workers were also assumed to be indoor workers and to have potential exposure to site groundwater used as a potable water source. The industrial worker exposure assumptions for ingestion, dermal contact, and dust inhalation are included in Table 4s of this appendix. The dermal exposure route assumptions were selected for all receptors from the EPA dermal guidance, as cited above.

L.1.7.4 Recreational Receptors

The site is fenced for most of its length along Highway 200. However, the adjacent canal is used by Vieques Conservation Trust for occasional visitors to observe bioluminescence activity in the canal. Also, Highway 200 is the main access road for visitors to the beaches in the western portion of the island. While no visitors are anticipated within the SWMU 6 boundary, there is a possibility for people to trespass onto SWMU 6. Therefore, a recreational scenario is indicated to represent exposure to trespassers as well and is identified as potentially complete under current and future land use.

Currently and in the future, it is possible that the site could be used for recreational purposes, which may include hiking along the nature trails and other outdoor activities. Visitors to the area may inadvertently walk into the wetland that is part of the site. Recreational receptors are assumed to have direct contact with site soils, sediments, and surface water from adjacent surface water body. Recreational users are not expected to have exposure to site groundwater, so a groundwater exposure pathway is incomplete. Exposure at this site was thus assumed to occur via surface soil, sediment, and surface water as the site is being used for recreational purposes. Though the site is likely too small to support complete recreational activities-related exposures during an outing, such a scenario was assumed as a conservatively protective pathway evaluation. Recreational adult, youth, and child receptors were evaluated. The exposure factors for the ingestion, dermal contact, and inhalation exposures to an adult, a youth and a child receptor are included in Table 4s presented in Attachment 1 of this appendix.

L.1.7.5 Residential Receptors

To evaluate the most conservative future land use scenario for the site, residential land use was considered to occur where site-specific conditions permit. Future residents were assumed to have direct contact with surface and subsurface soils and to use site groundwater as their potable water source. The site is a wetlands and is not conducive in its current setting to residential use; however, this scenario was evaluated to provide the most conservatively protective risk estimation. If the risks for this scenario are within target limits, the site can be used for unrestricted (i.e., residential) land use. The default exposure assumptions for an adult and child were used, as listed in the above guidance documents, and provided in table 4s of this appendix. A child is assumed to have an EF of 350 days/year and an ED of 6 years. For an adult, the EF is 350 days/year, and the ED is 24 years. Thus, the total ED for a residential receptor is 30 years.

L.1.8 Exposure Route Factors

The exposure route factors used for intake and risk estimates at the site, for each receptor identified, are listed in the RAGS Part D tables as well as the site-specific risk estimation tables. All of the risk estimations are presented in RAGS Part D format as Attachment 1 in this RI report, as the EPA guidance recommends using this format to minimize the narrative text documentation in the report.

L.1.8.1 Surface and Subsurface Soil Ingestion

Ingestion exposures to surface soil were evaluated for the appropriate receptors and media identified in the site-specific CSM. The ingestion intake of soil for a worker was assumed to be 100 mg/day, a default exposure factor derived from EPA (1997b). The incidental IR of soil for an outdoor maintenance worker is 100 mg/day, and for a recreational adult, youth, or child the IRs are 100 mg/day, 100 mg/kg, and 200 mg/day, respectively. For residential receptors, the incidental ingestion of soil by an adult is 100 mg/day and 200 mg/day for a child.

Subsurface soil exposure was evaluated for a future construction worker and also to residential adult and child. A construction worker is assumed to have an IR of 330 mg/day. Exposure assumptions for residential receptors are same as those listed for surface soil exposures.

L.1.8.2 Groundwater Ingestion

The shallow water-bearing zone at SWMU 6 has high salinity making it unsuitable for consumption. However, for conservative risk evaluation purposes, potable use is assumed. Ingestion of groundwater by a worker was assumed to be 1 L/day. Ingestion for a residential adult and child was assumed to be 2 L/day and 1 L/day, respectively.

L.1.8.3 Sediment Ingestion

Ingestion exposures to sediments were evaluated for the recreational receptors. The ingestion intake of sediment for an adult and a youth is assumed to be 50 mg/day, and for a child it is assumed to be 100 mg/kg. These assumptions are based on best professional judgment and current practices derived from EPA, using best professional judgment in consultation with EPA at other federal sites.

L.1.8.4 Surface Water Ingestion

Ingestion exposures to surface water were evaluated for the recreational receptors. The ingestion intake of sediment for an adult, a youth, and a child is assumed to be 0.025 L/hr. The outing time is assumed to be 2.6 hour. These assumptions are based on best professional judgment as previously stated.

L.1.8.5 Surface and Subsurface Soil Dermal Contact

The skin surface area available for contact was estimated using best professional judgment and was based on current practices derived from EPA guidance. The surface areas used were selected from the latest dermal guidance (RAGS Part E, as listed above). The soil adherence factors were estimated using body-part and activity-specific data, also from RAGS Part E. In addition, the dermal exposure estimation was performed according to the equations in RAGS Part E.

L.1.8.6 Groundwater Dermal Contact

Residential receptors were assumed to have dermal contact with groundwater. Dermal contact was assumed to occur through showering/bathing and includes an ED of 0.54 hour for an adult and 1.0 hour for a child, for daily exposure to the entire estimated skin surface area. An industrial worker is assumed to have a dermal exposure through washing hands, face and forearms while at work.

L.1.8.7 Sediment Dermal Contact

Dermal contact with sediments during wading in the surface water body adjacent to SWMU 6 where sediment samples were collected was evaluated for the recreational receptors. The dermal contact intake assumptions are included in Table 4s presented in Attachment 1 of this appendix for SWMU 6 for an adult, a youth, and a child. These assumptions are based common use at other federal sites, developed using best professional judgment in consultation with EPA at other federal sites.

L.1.8.8 Surface Water Dermal Contact

Dermal contact with surface water during wading in the ditch was evaluated for the recreational receptors. The dermal contact intake assumptions are included in Table 4.4 in Attachment 1 of this appendix for SWMU 6 for an adult, a youth, and a child. These assumptions are based common use at other federal sites, developed using best professional judgment in consultation with EPA at other federal sites.

L.1.8.9 Surface and Subsurface Soil Inhalation

Inhalation of dust from surface soils was assumed to occur for workers, recreational users, and residential receptors. For workers, the default IR is 20 cubic meters (m^3)/8-hour work-day. For construction workers, subsurface soil exposures through inhalation of dust were evaluated. The IR for recreational receptors is assumed to be 20 m^3/day for adults and youths, and 10 m^3/day for children. The IRs for residential adults and children are assumed to be 20 m^3/day and 10 m^3/day, respectively.

The default particulate emission factor (PEF) of 1.36E+9 m^3/kg from the latest supplement to the EPA Soil Screening Guidance (EPA, 2001) listed above was selected.

L.1.8.10 Groundwater Inhalation

This pathway was assumed not to be applicable at SWMU 6 because other than the common laboratory contaminant chloroform, which was found in 1 of 10 samples, no other VOC contamination is identified in the groundwater.

L.1.8.11 Chemical-Specific Factors

Dermal absorption factors (ABS_{dermal}) and permeability constants (Kp) were obtained from RAGS Part E, as listed above.

L.1.9 Exposure Quantitation

Intake estimates and EPCs are discussed below.

L.1.9.1 Intake Estimates

The intake estimates for each exposure route identified are listed along with the intake factors used for intake estimations in the RAGS Part D tables. For each receptor identified in the exposure assessment as having a complete exposure pathway, chemical- and media-specific intakes, known as chronic daily intakes (CDI), were estimated using the appropriate exposure factors and assumptions. The exposure assumptions used for the scenarios identified above are listed in this appendix.

Chronic exposure (represented by CDI) is expressed in terms of milligrams of chemicals contacting the body/kilogram of body weight/day (mg/kg/day). For the exposure routes evaluated, the following generic equation represents the intake dose estimations:

$$Exposure(mg/kg/day) = \frac{CxIRxEDxEF}{BWxAT}$$

where

C = concentration of chemical in medium or EPC
IR = intake or ingestion rate
EF = exposure frequency
ED = exposure duration
BW = body weight
AT = averaging time (period over which exposure is averaged)

This appendix includes tables of exposure factors for the potential receptors, exposure routes, and exposure pathways.

L.1.9.2 Exposure Point Concentration

The EPC is the reasonable upper-bound estimate of the mean concentration that is contacted over the exposure period. The EPC is recommended by EPA to be near the UCL_{95}, which is approximately 95 percent of the arithmetic average (EPA, 1989).

The UCL_{95} was calculated using site data and the EPA's latest ProUCL tool (EPA, 2003). The Pro UCL software is available online at http://www.epa.gov/nerlesd1/tsc/software.htm. The estimated EPC values were the upper confidence limits at 95 percent or higher (UCL97.5% and UCL99%) above the mean. In estimating the EPCs, one-half the detection limit was

assumed for non-detects. The duplicate samples collected were used during DQE to determine analytical precision and homogeneity of the data (Appendix J). The normal samples were selected for risk assessment. The results of the estimated EPCs for surface soil, subsurface soil, groundwater, surface water, and sediment are summarized in more detail in Tables L-6 to L-9 and in Table 3s presented in Attachment 1 of this appendix. Since the HHRA was conducted, a more recent version of ProUCL has been issued by EPA. Although the HHRA conducted as part of the Draft RI Report will not be re-done (as discussed previously), the most up-to-date version of ProUCL will be used to perform the risk assessment associated with the removal action.

The total and dissolved metals analytical results from groundwater samples were used for COPC selection. However, only the total metals analytical results were used for EPC calculation in the risk estimations. The dissolved metals data are presented to indicate that the observed metals in the groundwater samples could be associated with suspended particles in the water samples. This is discussed again at the end of the risk assessment when comparing site data with the background groundwater metals concentrations after risk characterization. EPA Region 3 guidance indicates that if a notable disparity exists in concentrations in filtered versus unfiltered data for aluminum, iron and manganese, then filtered samples should be used for risk assessment. However if the differences are minor, then unfiltered samples should be used for risk assessment (EPA, 1992).

L.1.10 Toxicity Assessment

The toxicity criteria used in this risk assessment were obtained from the following sources:

The Integrated Risk Information System (IRIS), a database available through the EPA National Center for Environmental Assessment (NCEA) in Cincinnati, Ohio. IRIS, prepared and maintained by the EPA, is an electronic database (http://www.epa.gov/iris/) containing health risk and EPA regulatory guidance information regarding specific chemicals. This database was the primary source of toxicity values used.

For chemicals with no toxicity criteria listed on IRIS, EPA Region 2 contacted the National Center for Environmental Assessment (NCEA) for interim toxicity criteria. The toxicity values provided by EPA are included in Tables 4s and 5s in Attachment 1 of this appendix.

The Health Effects Assessment Summary Tables (HEAST) is provided by the EPA Office of Solid Waste and Emergency Response (OSWER; EPA, 1997c), which compiles toxicity values published in various health effects documents issued by EPA.

For chromium, a hexavalent chromium-based toxicity factor was used as a conservative risk evaluation measure.

The toxicity profiles for the interim toxicity values from NCEA were provided by EPA Region 2 and are included in this appendix. Since the HHRA was conducted as part of the Draft RI Report, toxicity criteria for some constituents may have been modified or withdrawn, which may affect the risk assessment conclusions. However, as noted previously, a new risk assessment will be performed as part of the removal action. The new risk assessment will use the most up-to-date toxicity criteria.

L.1.10.1 Dermal Toxicity Factors

Adjustments of oral toxicity values were considered to estimate the effects of dose absorbed through skin. Recommended ABS_{GI} values from RAGS Volume I, *Human Health Evaluation* Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Interim Review Draft (EPA/540/R/99/005) were used. These values are provided in the RAGS Part D-formatted Tables 5.1 and 6.1 in Attachment 1 for the identified COPCs.

L.1.10.2 Carcinogenic Polycyclic Aromatic Hydrocarbons

At SWMU 6, several PAHs were identified as COPCs in soils, and benzo(a)pyrene was identified as a COPC in sediment. However, all of these individual PAH constituents were evaluated separately, and risks were combined in the risk summary tables.

L.1.11 Risk Characterization

The exposure and toxicity information was integrated to estimate the potential cancer risks and noncancer hazards (or hazard index, HI). The estimated excess lifetime cancer risk (ELCR) and HI provide a basis for site-specific risk management decisions. The cumulative risks and HIs are then compared against the target risk ranges. For the purposes of regulatory decision-making, the EPA recommends a target risk range of 1E-4 to 1E-6 (1 to 100 in a million). Typically, results falling within or below this range will serve as a basis for recommending no further investigations at a site. An HI value above 1.0 is further evaluated to determine if any individual target organ HIs exceed a value of 1.0. Unless the cumulative HI to a target organ exceeds an HI of 1.0, it is typically not considered an exceedance. The conservative nature of the analysis and the uncertainty inherent in the risk assessment were considered when interpreting the results. The uncertainty associated with the risk estimations is discussed in the uncertainty section below.

Lead was detected in soils at SWMU 6 at concentrations above background levels. Lead is not included in risk calculations, as EPA guidance for lead evaluation is different from other chemicals, and a toxicity value is not available for this chemical. The EPA provides screening concentrations as the first step to evaluating lead exposures in a residential exposure scenario. The surface soil lead concentrations ranged between a minimum of 3.58 mg/kg and a maximum of 617 mg/kg, with a mean concentration of 78.5 mg/kg. The screening levels for the conservative health protection-based lead concentrations that are considered protective of a residential child is 400 mg/kg, as listed in EPA Region 9 PRG tables. The health protective levels for lead are derived based on average exposures. Thus, the site mean concentration was used to compare against the residential child protective value for lead to determine if any health effects are anticipated under residential land use scenario. The site mean value of 78.5 m/kg is lower than the residential child protective screening concentration of 400 mg/kg. Based on the average lead being much lower than the health-protective concentration, lead is not considered a COC at SWMU 6.

The cancer risks or non-cancer HIs from chemicals occurring in the background are also identified to determine whether the estimated risks and hazards are related to the site or are a result of background conditions. When risks and HI are similar to the background, remedial actions are not generally recommended. The possible limitation of comparisons with site-specific background is availability of only a few background samples. For example, only one round of sampling from a single background well was used to compare with the

site data. This adds to uncertainty in comparison of site data to background conditions. Table L-10 includes a summary of the risks and HIs estimated for the various receptors from potential exposure to soils, sediments, surface water, and groundwater.

The DOI collected and chemically analyzed two individual land crab (*Cardisoma quanhumi*) samples and one composite fiddler crab (*Uca* sp.) sample from SWMU 6 and reported the tissue analytical results (DOI, 2002). The DOI's apparent purpose for the crab tissue sampling was a concern that wildlife resources may be impacted by the presence of site-related contaminants. These results are briefly evaluated in this section.

Chemicals of potential concern in land crab tissues identified include DDE, DDT, cadmium, lead, and vanadium. The DDE and DDT were detected in one of the two samples, at concentrations of 0.52 mg/kg and 0.11 mg/kg, respectively. For cadmium, lead, and vanadium, the maximum concentrations measured in the land crabs were: cadmium = 1.6 mg/kg dry weight. (wt); lead = 4.99 mg/kg dry wt.; and vanadium = 1.56 mg/kg dry wt. Fiddler crabs were not included, due to their small size, indicating that they are not suitable as food items. The detected metals are not above levels of the fish consumption-based PRG estimated (see Appendix I) for cadmium at 2.33 mg/kg and vanadium PRG at 16.33 mg/kg. A similar criterion could not be estimated for lead, as there are no toxicity criteria for lead. Also, all these inorganic chemicals occur in "background" crabs.

At the maximum detected concentration of DDT/DDE in the one land crab sample, EPA fish advisories indicate an allowable consumption rate of 1 to 9 meals of 85 grams to 227 grams per meal within a period of 10 days. This is based on the one detected concentration. If the concentrations are averaged between the two samples (including the nondetect), the allowable consumption rates will increase. However, the use of these data for ingestion is questionable, as the values represent whole body measurements, whereas the fleshy portion of the crab is typically consumed. Additionally, industry standard QA/QC documentation for the analysis was not included for review. Because the sample locations are not identified by the DOI and DDT/DDE were not detected at elevated concentration in site media, nor were they human health COPCs, these crab sampling results are not included for further quantitative risk analysis.

For **a future maintenance worker**, the ELCR for exposure to surface soils is 1.5E-6, which falls within the target risk range of 1E-4 to 1E-6. The estimated HI for exposure to surface soils is 0.069, which is below the target HI of 1.0 for noncarcinogenic exposure. Thus, maintenance worker exposure to site surface soils is not likely an unacceptable carcinogenic or noncarcinogenic health risk.

For **a future industrial worker**, the ELCR for exposure to surface soils is 7.3E-6, which falls within the target risk range of 1E-4 to 1E-6. The estimated HI for exposure to surface soils is 0.33, which is below the target HI of 1.0 for noncarcinogenic exposure. The carcinogenic risk from exposure to groundwater is 4.1E-4, which is above the upper-bound target limit of 1E-4, from arsenic in groundwater. The estimated HI is 21.8, which is also above the target value of 1.0, due to the presence of thallium, manganese, perchlorate, antimony, and arsenic. Both carcinogenic and noncarcinogenic risks were above target limits, primarily from inorganic chemicals and a single detection of perchlorate in a well located offsite to the south of Highway 200.

For **a future construction worker**, the ELCR for exposure to SWMU 6 subsurface soils is 6.6E-8, which falls below the target risk range of 1E-4 to 1E-6. The estimated HI for exposure to subsurface soils is 0.02 and is below the target HI of 1.0 for noncarcinogenic exposure. Thus, construction worker exposure to site surface soils is not likely an unacceptable carcinogenic or noncarcinogenic health risk.

The estimated combined ELCRs for a **current/future recreational adult, youth,** and **child** exposed to surface soils are 2.8E-5, 1.6E-5, and 3.8E-5, respectively, and are within the target risk range. The HIs are 1.1, 1.5, and 6.6, respectively, which are above the target HI of 1.0. The exceedance of HI of 1.0 is due to the presence of thallium and arsenic in the sediment, which are also detected in background sediments. The exceedance of HI of 1.0 is due to the presence of thallium, manganese, perchlorate, antimony, and arsenic. The well with a perchlorate detection was resampled in February 2004, during which perchlorate was not detected (see Appendix I). It is likely a false positive detection at the site. The target organ-specific HI exceeded 1.0 for kidneys, primarily from thallium.

For a **future residential adult**, the ELCR is 9.8E-6 from surface and subsurface soil, and from groundwater it is 1.1E-3. Risk from groundwater is above the target risk range due to arsenic in the groundwater. The HIs are 0.39 from subsurface and surface soil and 61 for groundwater, which exceeds the HI of 1.0. The groundwater HI is associated with perchlorate, antimony, arsenic, manganese, and thallium. As stated above, perchlorate was not detected during subsequent confirmation sampling and, therefore, was likely a false positive detect (DoD, 2002).

For a **future residential child**, the ELCR is 2.2E-5 from surface and subsurface soil combined, which is within the target range, and 6.4E-4 from groundwater, which exceeds the target range, primarily from arsenic. The HI for exposure to surface and subsurface soils is 3.3, which exceeds the target HI of 1.0, primarily due to iron and vanadium. The HI from groundwater is 143, which exceeds the target HI of 1.0, from thallium, manganese, perchlorate, antimony, arsenic, cadmium, iron, and selenium in groundwater.

L.1.12 Uncertainties

The following section summarizes the general uncertainties associated with various risk assessment steps.

The risk estimations included several exposure assumptions, exposure factors, EPC estimations, site conditions, and receptor behaviors. Because these are assumed values, there is an inherent uncertainty associated with these hypothetical scenarios, as well as practical limitations to obtaining an actual value versus an assumed value. Also, the inclusion of chemicals that occur in background conditions attributes risks to a site, even though these chemicals are not likely to be specific to the site. Some of the chemicals included as COPCs were detected only once in the historical data, with questionable occurrence at the site at the present time. The toxicity factors supplied by the EPA use several extrapolation methods that contain inherent uncertainty and tend to include conservatively protective assumptions during such extrapolations. Such uncertainty in toxicity factors is not addressed in this assessment, as EPA sources provide adequate documentation of such uncertainty.

As noted previously, one of the most significant sources of uncertainty is associated with where the soil samples were collected that were used to assess the levels of contamination and the potential risks they pose. Because soil samples were collected primarily adjacent to waste piles instead of directly through them, it is possible that the soil constituent concentrations may have been underestimated in the area of contamination. This, then, may have affected the COPC selection and, ultimately, the levels of risks calculated for the various exposure scenarios. However, as noted previously, a new risk assessment will be performed (as part of the removal action) that includes soil samples collected from within the area of excavation, which will address this uncertainty.

L.1.12.1 COPC Selection

The chemicals detected above criteria are inorganic chemicals that occur in soils as part of the natural mineralogy and, with the exception of perchlorate, have been detected in the background soils. A number of the detected concentrations (Tables L-11 and L-14) are within the range of background samples presented in the final background investigation report (CH2M HILL, October 16, 2002). Most also occur naturally in groundwater, adding significant uncertainty to the assumption that risks are attributable to SWMU 6. Also, some of the COPCs were not detected upon resampling the same well, indicating that the inclusion of these chemicals as COPCs likely provides a conservative assessment of potential risks.

For some of the inorganic chemicals, there are no generic SSLs. However, these chemicals were typically detected within the range of background concentrations (see Table L-11) for soils at the former NASD or do not likely present a threat of migration to groundwater. Therefore, despite the lack of a quantitative screening value, these COPCs either may not represent site-related contamination and may be part of the soil mineralogy or likely do not readily leach to groundwater; thus, there the absence of SSL values may not significantly affect the conclusions.

L.1.12.2 Exposure Assessment

The site is an old disposal area with limited or no direct access, and the assumption of industrial and residential use is overly conservative. Groundwater in this area has high salinity, so the potable use assumption is likely unrealistic and overly conservative. Any alteration to land use is unlikely to change the land use for this site itself, so exposure evaluations may represent overly conservative assumptions for the risk estimations. Some of the scenarios may underestimate the risks; for example, exposure to groundwater by a construction worker was not quantified. However, the total dose from dermal exposure to the COPCs identified in groundwater is not likely to be significant.

L.1.12.3 Toxicity Assessment

The uncertainty associated with extrapolation of toxicity from animal data to humans is described in the EPA databases. Also, most of the inorganic chemicals, particularly iron, are essential nutrients, introducing additional uncertainty to the toxicity assumptions. In addition, all the toxicity studies are based on exposure to the pure form of the inorganic, and bioavailability limitations from exposures to soil minerals are not part of the toxicity assessments; this adds further uncertainty to these toxicity factors.

L.1.12.4 Risk Characterization

The propagation of uncertainty in the other steps such as COPC selection, exposure assessment, and toxicity assessment also introduces uncertainty into the risk estimates.

L.1.13 Comparison with Background Levels

A background study was conducted to characterize the environmental media for the western portion of Vieques Island (CH2M HILL, 2002b). The primary purpose of the study was to develop a set of background values for inorganic chemicals that occur commonly in environmental media, to be used for comparison with site samples collected during this investigation within the former NASD.

The background surface soil samples included in the background study report were collected from 0 to 6 inches bgs from 26 locations. Subsurface soil samples were collected from 11 of the surface soil sampling locations at depths ranging from 2 to 6 feet bgs, depending on the depth to rock in the sampling area. Five rock samples were also collected from the southwestern end of Vieques. Groundwater was sampled from five newly installed background wells. During the RI, two site-specific background wells (NDW06GW07 and NDW06GW08) were installed upgradient and farther east of SWMU 6. Sediment and surface water background samples were collected from the adjacent surface water body (Arenas Lagoon). Most of the previously sampled sediment and surface water sampling locations from Expanded PA/SI were resampled during the RI.

Tables L-11 to L-13 show a comparison of the soil, groundwater, and sediment background inorganic chemical data against inorganic chemical levels for the chemicals presenting cancer risk or HI above the target levels at SWMU 6.

L.1.13.1 Soils

Table L-11 presents a comparison of background inorganic chemical levels with site soil concentrations. As can be noted from the table, the site and background ranges of most of the chemicals detected overlap. The maximum levels at the site for iron and lead are higher than the background levels. However, these chemicals do not likely present an unacceptable risk. Two inorganic chemicals in surface soil, iron and vanadium, had an HI above 1.0. Their distribution is discussed below.

L.1.13.2 Iron

The human health risk assessment indicated that the hazard index estimated for a future residential child from surface soil exceeds the target value of 1.0. The HI for a future residential child from iron is 1.2. The iron concentrations in soil range from 2,960 to 93,200 mg/kg, with a mean of 18,500 mg/kg. The range of iron concentrations in the background soils is between 2500 mg/kg to 39,000 mg/kg.

Figure L-2 presents the extent of iron distribution in soil samples at SWMU 6. SWMU 6 surface soil has elevated iron levels in two locations. The maximum iron concentration location (NDW06SS23) is also where piles of rusted and disintegrating metal debris were observed at the site. One other sample from adjacent location (NDW06SS01) has iron at 80,000 mg/kg. No other samples at the site had elevated iron levels as can be noted in Figure L-2. The UCL95% value calculated for iron was at 27,982 mg/kg, which is similar to

the background UTL95% value. Thus, though isolated locations had elevated iron levels, the overall site upper-bound averages are similar to background upper-bound average concentrations. Thus, iron levels represent health effects that are similar to those presented by background iron levels. Therefore, no further actions are recommended to address iron in site soils from a risk standpoint.

L.1.13.3 Vanadium

The hazard index to a future residential child from vanadium in SWMU 6 surface soils is estimated at 1.2, contributing at similar levels as iron to the total HI of 3.3. Vanadium concentrations (see Table L-11 and Figure L-2) in site soils range from 9.84 to 71.4 mg/kg, with a mean concentration of 28.2 mg/kg, compared to a background concentration range from 9.0 to 130 mg/kg, with a mean concentration of 50 mg/kg. The site concentration range is lower than the background concentration range. The detected vanadium does not appear to be related to the SWMU 6 metal debris and likely represents the general background sediment vanadium levels at this site. Therefore, no further actions are recommended from a risk standpoint to address vanadium in soils at SWMU 6.

L.1.13.4 Groundwater

Figures L-3 and L-4 present the metals distribution in site groundwater wells for the chemicals that are significant contributors to the overall cancer risk and the HI. Table L-12 presents a comparison of site groundwater inorganic levels with the background levels for chemicals that contribute above the upper limit of the target risk level or HI above the target value of 1.0. Of the inorganic COPCs, arsenic is the most toxic chemical and drives most of the estimated cancer risks; it also contributes significantly to the groundwater HI estimated for the future potable use scenarios. Additionally, antimony, cadmium, iron, manganese, selenium, and thallium contribute significantly to the total HI from groundwater potable use at SWMU 6. Most of these groundwater COPCs were also detected in the general background wells and in the two site-specific background wells (NDW06MW07 and NDW06MW08).

Site groundwater has TDS levels estimated to be between 39,000 and 53,000 mg/L, which are similar to those expected in sea water and is not fit for potable use. However, such a use scenario was evaluated as a conservative risk estimation measure.

Although there are uncertainties associated with the conclusions drawn regarding the particular constituents and concentrations attributable to leaching from the waste, the removal action will address the source of future contamination due to leaching, which will allow groundwater to return to pre-effect (if any) conditions. Post-removal-action groundwater sampling will help confirm residual groundwater constituent concentrations do not pose an unacceptable risk.

L.1.13.5 Antimony

Antimony contributes to the elevated HI (= 17; see Attachment 1, Table 9.5) from groundwater potable use. The range of antimony detected in site wells is from 3.7 to 104 µg/L. A total of 4 wells had elevated antimony levels; these wells are NDW06MW02, NDW06MW03, NDW06MW05 , and NDW06MW06, with the maximum concentration detected in well NDW06MW03 (see Table 4-7 and Figure L-3), located on the northern end of

the SWMU 6 waste boundary. The dissolved concentrations were all nondetects in these four wells. No wells at the site had dissolved antimony levels above the health-based PRG values. Therefore, site antimony is likely related to suspended solids from the metal debris particles or from sediment/soil matrix. It is not in a dissolved form and thus is not likely an exposure concern from future potable use or to the biota at the site. Therefore, no further actions are recommended from a risk standpoint to address antimony at SWMU 6.

L.1.13.6 Arsenic

Levels of some of arsenic in the site wells were higher than levels from the site-specific background wells.

Iron and manganese were elevated in several filtered groundwater samples indicating that they are likely present in reduced oxidation states. This occurrence is common in shallow coastal aquifers that contain organic-rich sediments and suggest that iron and manganese reducing conditions exist in the shallow aquifer. Dissolved arsenic is often naturally present under such conditions.

Arsenic was detected in site wells NDW06MW01 to NDW06MW06 (see Figures 4-5 and L-3) and was highest in NDW06MW05 (152 µg/L) during the RI sampling round. The second-highest arsenic level was in NDW06MW06 (total arsenic at 120 µg/L and dissolved arsenic at 30.3 µg/L) located in the northeast corner of the site, where no metal debris was observed and no elevated soil metal concentrations were detected. While total arsenic levels ranged from 3.5 to 152 µg/L, the dissolved arsenic levels ranged from 4.8 to 30.3 µg/L, indicating that most of the elevated arsenic was from suspended particulates in the water samples. NDW06MW01 is located south of Highway 200, physically isolated from where noticeable waste is present in the SWMU 6 area, indicating that observed arsenic may be attributable to geochemical conditions rather than to the wastes discarded in this wetland area. Also, site soils do not exhibit high arsenic levels, so the observed levels of groundwater arsenic and its related risks do not appear to be attributable to the site.

L.1.13.7 Cadmium

Cadmium contributes to the HI through potable use of the groundwater at a maximum level of 1.2, which is relatively low compared to other metals' contribution discussed in this section. The range of cadmium in site groundwater was between 2 µg/L to 14.2 µg/L in site wells, with the maximum levels being reported in well NDW06MW05. This well is located within the area with metals debris piles, and could be related to the site metal waste disposal. However, the dissolved cadmium was below detection limits in the two highest detected wells. The highest dissolved cadmium at 2.9 µg/L is in well NDW06MW01, located across Highway 200 south of the main SWMU 6 disposal area. Elevated cadmium was not detected in soils in the area where dissolved cadmium is identified (see Table 4-7 and Figure L-3). Thus, the elevated cadmium levels in groundwater appear to be associated with suspended particles. The observed cadmium does not appear to be associated with metal wastes present at the site. Therefore, no further investigations to address cadmium were recommended for SWMU 6 from a risk standpoint.

L.1.13.8 Iron

Iron contributes to an HI of 1.3 to a future residential child estimated based on potable use of site groundwater. Iron was detected in site groundwater at concentrations ranging between 43 µg/L to 6,090 µg/L. The site-specific upgradient well did not have iron at detectable levels. The background groundwater iron levels in basewide background wells ranged between 480 ug/L to 4,800 µg/L. Only one well exceeded this range of background levels; this was well NDW06MW03, located north of the identified waste piles (see Figure 4-5). The maximum detected dissolved iron is also elevated in this well. The observed iron levels are similar to those detected in other sites located in wetland areas (e.g., AOC J and AOC H). Though site surface soil has elevated iron in two of the sampled locations, iron in groundwater does not correspond to these locations, and iron levels in groundwater at the site are indicative of typical wetland geochemical conditions. Thus, site groundwater iron levels do not appear related to waste disposal activities at SWMU 6. Therefore, no further actions are recommended from a risk standpoint to address iron at SWMU 6.

L.1.13.9 Manganese

The manganese HI to a future residential child during potable use was estimated at 28. The range of manganese concentrations in site groundwater was 339 to 14,300 µg/L (see Appendix I, Table I-2), compared to background ranges of 476 to 616 µg/L from the two upgradient wells and 400 to 17,000 µg/L basewide. The dissolved manganese in site wells ranged between 315 and 11,800 µg/L. The highest manganese levels were detected in well NDW06MW01, located across the Highway 200 (see Figure L-4). The latest round of sampling conducted in 2003 from the same well, NDW06MW01, had manganese at 529 µg/L, with the dissolved manganese level at 499 µg/L, indicating that concentration levels could fluctuate with changes in regional conditions and thus with geochemical conditions in the area. The site soils did not have elevated manganese levels. The elevated dissolved manganese and dissolved iron levels are indicative of a reducing environment at this wetland site. The levels of manganese detected are similar to those detected in other RI sites such as AOC J. Though manganese is widely distributed in site groundwater, it does not appear to be associated with site scrap metal disposal activities. Thus, no further investigation is recommended from a risk standpoint to address manganese in groundwater at SWMU 6.

L.1.13.10 Selenium

The HI from selenium to a future residential child during potable use was estimated at 1.3. The selenium concentrations in site groundwater ranged from 5.9 to 191 µg/L (see Table 4-7), compared to a background range of 9.4 to 76.7 µg/L from the two upgradient wells. The five basewide background wells did not have detectable levels of selenium. The dissolved selenium was higher in both site wells and background wells than the total selenium (see Tables 4-1 and 4-7). The site dissolved selenium detected concentrations ranged between 5.7 to 253 µg/L. The two wells with the highest total selenium levels did not have dissolved selenium in them. The well with the highest dissolved selenium (NDW06MW05) had total selenium of 127 µg/L, while the dissolved selenium was at 253 µg/L, which is an uncertain and questionable result, as total selenium is supposed to include dissolved selenium as well. Site soils did not have elevated selenium levels. There were no dissolved selenium detections in wells located in the waste areas, and other wells where dissolved selenium was

detected are near the roadway and not corresponding to the presence of waste. Thus, selenium does not appear to be related to site activities. Its presence in site groundwater is potentially representative of the marine wetland environment. Therefore, no further activities are recommended from a risk standpoint to address selenium in groundwater at SWMU 6.

L.1.13.11 Thallium

The HI from thallium to a future residential child during potable use was estimated to be 48. The total thallium was detected in 2 samples of 10 in site wells, with concentrations ranging between 56.5 µg/L in well NDW06MW04 and 60.4 µg/L in well NDW06MW05. There was no dissolved thallium in these wells. The background site-specific wells did not have thallium at detectable levels. The basewide background wells had thallium ranging between 4.8 and 18 µg/L. The two wells where total thallium was detected are located within the waste disposal area. These same two wells, NDW06MW04 and NDW06MW05, did not have thallium above criteria in 2000 sampling, and other wells within the waste area did not have elevated thallium levels. The site soils do not have elevated thallium levels. Based on the absence of dissolved thallium, the observed thallium is likely from suspended solids in groundwater samples. Therefore, thallium is not recommended for further investigation, as its presence does not appear related to site activities.

L.1.13.12 Sediment

Figure 3-5 presents the locations of the sediment samples collected. The sample locations from the Expanded PA/SI were resampled during the RI. Table L-13 presents a comparison of the site sediment thallium level with the background thallium levels. Figure L-5 presents the thallium detected in all sediment samples. Several of the metals, including thallium, were in one sample (NDW06SD02) collected during the Expanded PA/SI conducted in 2000. This one sediment location when resampled (NDW06SD12) did not indicate similarly elevated metals (see Table I-2 in Appendix I). Another adjacent sample (NDW06SD13) did not have elevated metals concentrations. This previous detection may be associated with inclusion of a piece of metal in the sediment sample. The presence of elevated metals does not appear to be widespread, or they do not appear specific to the site activities, as these samples are collected from the canal that is separated from the site, near the metal bridge. Therefore, no further investigations or actions are recommended to address metals in sediments from around SWMU 6.

L.1.14 HHRA Summary and Conclusions

The chemicals identified as COPCs were inorganic chemicals and SVOCs (PAHs) in soils, chloroform, historical detection of PCBs and inorganic chemicals in groundwater, one SVOC and metals in sediments, and inorganic chemicals in surface water.

The risk assessment evaluated the exposure of potential receptor populations including maintenance workers, industrial workers, construction workers, recreational receptors, and residential receptors. The estimated cancer risks from soils were within the target range for all receptors. The HI for soils was above the target limit for the residential child due to the presence of iron and vanadium in soils. Also, the residential adult cancer risks (1.1E-03) and HI (7.0) from groundwater exposure through potable use were above the target limits due to arsenic. Both carcinogenic risk and HI were above the target limits for a residential child as

well due to arsenic in groundwater. The groundwater HI is well above the target value of 1.0 due to presence of inorganic chemicals antimony, arsenic, cadmium, iron, manganese, selenium and thallium. However, the high total dissolved solids levels are indicative that site groundwater is similar to sea water and is not fit for potable use. The metals detected in the site wells appear to be either associated with the suspended solids in water samples or due to geochemical processes that increase dissolved concentrations of some of the major cations such as iron and manganese. However, the high TDS levels in groundwater in this area would preclude its use as a drinking water supply, and thus consumption of this groundwater is not likely.

Perchlorate was detected in one of the wells, and resampling did not confirm its presence. Detection of perchlorate is likely a false positive value (DoD, 2002), and thus perchlorate is likely not present at the site.

The organic chemicals in site soils, groundwater, sediment, and surface water do not present significant risks or hazards. All the other chemicals are inorganics. As explained above, none of the inorganic chemicals presents an unacceptable human exposure-related health risk that is likely specific to previous SWMU 6 operations. The site groundwater is not potable, and exposure assumptions used in the risk assessment are very conservative and may be unrealistic. Therefore, no further actions are recommended for site media based solely on risk.

As noted previously, the uncertainty associated with the conclusions of the HHRA and the debris being a potential future source of contamination is such that a removal action is warranted to address the uncertainty.

L.2 Ecological Risk Assessment

L.2.1 Ecological Risk Assessment Process

This section presents a screening ecological risk assessment (SERA), constituting Steps 1 and 2 of the ecological risk assessment (ERA) process and the first step (Step 3) of a baseline ecological risk assessment (BERA) for SWMU 6. An ERA was conducted to evaluate the potential adverse effects to the environment at SWMU 6. This subsection defines the objectives of the ERA and describes the ERA process.

This ERA was conducted in accordance with the *Navy Policy for Conducting Ecological Risk Assessments* (CNO, 1999) and the EPA Ecological Risk Assessment Guidance for Superfund (EPA, 1997). The Navy ERA policy, which describes a process consisting of eight steps organized into three tiers, is conceptually similar to the eight-step ERA process outlined in the EPA ERA guidance for Superfund. The major differences between the Navy ERA policy and the EPA ERA guidance are that the former:

Provides clearly defined criteria for exiting the ERA process at specific points

Divides Step 3 (the first step of the BERA) into two distinct substeps (Steps 3A and 3B), with a potential exit point after Step 3A

Incorporates risk management considerations throughout all tiers of the ERA process

Steps 1 and 2 of the ERA process comprise the SERA, which is conducted using intentionally conservative assumptions. If complete exposure pathways exist at a site and the results of the SERA indicate that risks are possible, the site normally continues on to Step 3, the first step in the BERA, for the pathways, COPCs, and receptors identified in the SERA.

In Step 3A, a refined evaluation of exposure estimates is conducted using more realistic assumptions and additional methodologies relative to those used in the SERA, which is intended to be a very conservative assessment. Examples of more realistic exposure assumptions include using central tendency estimates (rather than maximums) for media concentrations, exposure parameters, and bioaccumulation factors. Examples of additional methodologies include consideration of upgradient and background concentrations, detection frequency, and bioavailability.

If risk estimates (and their associated uncertainty) are acceptable following Step 3A, the site will meet the conditions of the exit criteria specified in the Navy policy. If the Step 3A evaluation does not support an acceptable risk determination within acceptable uncertainty, the site continues to Step 3B.

In Step 3B, the preliminary conceptual model from the SERA is refined based upon the results of the Step 3A evaluation to develop a revised list of key receptors, critical exposure pathways, chemicals of concern (COCs, risk drivers), assessment endpoints, measurement endpoints, and risk hypotheses. Based upon the revised conceptual model, the lines of evidence to be used in characterizing risk are determined. Agreement on the revised conceptual model, COCs, exposure pathways, endpoints, and risk hypotheses constitutes the Scientific Management Decision Point (SMDP) at the end of Step 3.

L.2.2 Objectives of the ERA

The objectives of the SERA are to:

Determine if potential risks to ecological receptors warrant either: (1) additional assessment beyond the conservative screening steps of the ERA process (unacceptable ecological risks are possible), or (2) removal of the site from further ecological consideration (no unacceptable ecological risks likely).

Focus subsequent steps of the ERA process on the specific chemicals, pathways, and receptors of potential concern if unacceptable ecological risks are possible.

Identify any data gaps or areas of unacceptable uncertainty that may require the collection of additional data to support ERA evaluations beyond the screening level.

If the site is not screened out in the SERA, the evaluation continues to Step 3. The general objectives of the Step 3 ERA are to:

Refine the risk estimates from the SERA to determine if risks to ecological receptors from site-related chemicals are likely to occur based upon realistic exposure scenarios.

Focus subsequent data collection activities if potential risks are indicated, uncertainties are unacceptably high, and/or data gaps are identified.

At the conclusion of Step 3, there are three possible decision points:

No further action is warranted. This decision is appropriate if the evaluation indicates that sufficient data are available on which to base a conclusion of no unacceptable risk within acceptable uncertainty.

Further data are required. This decision is appropriate if the evaluation indicates that the potential for unacceptable risk exists and additional data to refine these estimates (e.g., additional analytical data, toxicity testing, measures of bioavailability) are needed. In this case, the site continues to Step 4 of the ERA process.

Take remedial action. This decision may be appropriate for circumstances in which the potential for unacceptable risks was identified but these potential risks could best be addressed through remedial action (e.g., presumptive remedy) rather than additional study.

L.2.3 Screening Ecological Risk Assessment

As discussed above, Steps 1 and 2 of the ERA process constitute the SERA, which is conducted using intentionally conservative assumptions. The principal components of the SERA are problem formulation, exposure estimation, effects evaluation, and risk calculation.

L.2.4 Screening Problem Formulation

Problem formulation establishes the goals, scope, and focus of the ERA. As part of problem formulation, the environmental setting of SWMU 6 is characterized in terms of the habitats and biota known to be present. The types and concentrations of chemicals that are present in ecologically relevant media are also described. A preliminary conceptual model is developed for SWMU 6 that describes potential sources, potential transport pathways, potential exposure pathways and routes, and potential receptors. Assessment endpoints, measurement endpoints, and risk hypotheses are then selected to evaluate those receptors for which complete and potentially critical exposure pathways are likely to exist. The fate, transport, and toxicological properties of the chemicals present at SWMU 6, particularly the potential to bioaccumulate, are also considered during this process.

L.2.4.1 Environmental Setting

This section presents a description of the environmental setting (habitats and biota) of SWMU 6. A summary of facility history is contained in Section 2. The major physiographic features (climate, topography, geology/soils, hydrology, and hydrogeology) of the former NASD and SWMU 6 are described in Section 2.

The description of the environmental setting is based on: (1) a site visit conducted by an ecologist during the RI sampling activities in 2003 and (2) a detailed habitat characterization conducted at SWMU 6 by Geo-Marine (2000). The habitat characterization was conducted to determine the presence of plant and animal species and to determine whether preferred habitat was present for any federally endangered or threatened plant and animal species.

The SWMU 6 area is located approximately 100 feet south of Vieques Passage. The site is accessed by Highway 200, which extends east-west through the site. The site is located in a mangrove swamp between two tidally influenced lagoons referred to as Kiani Lagoon North and Kiani Lagoon South.

SWMU 6 was used for disposal of solid and generic waste during the 1960s and 1970s. Waste materials extend approximately 100 to 120 feet north-northeast of Highway 200 from the east side of the Kiani Lagoon Bridge. Trash likely discarded at this site includes empty containers of lubricants, oil, solvents, and paints, broken glass, and rubble. A CH2M HILL inspection in conjunction with a munitions and explosives of concern (MEC) avoidance team (CH2M HILL, 2000) also identified ordnance items and solid waste from the base galley (such as pieces of broken glass and china). An IAS team in 1984 had estimated that this site contains approximately 800 cubic yards of material. A geophysical survey was conducted across the area during the Expanded PA/SI (CH2M HILL, 2000) to determine the extent of buried wastes within this landfill. No live MEC have been identified at this site. However, inactive MEC have been identified, such as inert concrete-filled practice bombs, empty bomb dispensers, and empty shell casings.

SWMU 6 has been relatively undisturbed since the late 1970s. Vegetation on the site consists of extensive black and red mangrove communities. SWMU 6 is adjacent to Kiani Lagoon to the south of the site. A canal that opens to Vieques Passage is located just west of the site and connects to Kiani Lagoon and El Pobre Lagoon. During tidal changes, a strong current flows either north or south through the canal depending on the stage of the cycle. Water levels in the lagoons rise and fall with the tidal cycles, and SWMU 6 has a low earthen berm along the western and northern boundaries that prevents tidal fluctuations from inundating the site. This berm was apparently installed to facilitate vehicle access for dumping solid waste on the site, which is located at elevations between sea level and 1 foot above msl. The flat, sandy terrain typically has damp soils with a few shallow depression areas near the northwest shoreline that temporarily hold water. Groundwater at the site was encountered at approximately 1 to 2 feet bgs during monitoring well installation. General groundwater flow is to the north in the direction of Vieques Passage. At SWMU 6, the groundwater flow varies depending on the tidal influence. The groundwater gradient may change direction from north to south or east to west depending on the tide.

Many small, low piles of exposed debris containing various materials such as scrap metal and glass are scattered throughout the site. Several debris piles are visible along the lagoon shoreline to the west and northwest of the site, indicating that transport of site contaminants to the adjacent surface water is possible. Mangroves and other plants are growing among or on top of these debris piles, and hermit and land crabs have multiple burrows among many debris piles. A chain link fence extends along the south side of the site, along Highway 200, that limits human access but would not limit wildlife access; other sides of the site offer points of unrestricted access.

Based on the above information, the SWMU 6 site is relatively undisturbed (except for exposed old debris piles) and provides suitable terrestrial habitat for plant, invertebrate, bird, and mammal communities. The adjacent aquatic saltwater habitat associated with the Kiani Lagoon system is supportive of fish, invertebrate, aquatic plant (mangroves), and semi-aquatic bird communities.

L.2.4.2 Flora

Vegetation communities at SWMU 6 were initially characterized into broad community types based on color signatures from true-color aerial photographs. Vegetation communities were delineated based on species composition and structure by viewing magnified stereo

pairs of aerial photography. The community types were marked on overlying acetate for use in the field (May 15-19, 2000). Personnel walked transects through SWMU 6 to (1) verify that the community types were identified and delineated correctly from the true-color aerial photography, (2) identify the species composition of the dominant vegetation, (3) identify the wildlife species present in SWMU 6, (4) identify habitat that may potentially support federally designated threatened and endangered species within and contiguous to the SWMU, and (5) identify any obvious impacts potentially related to site activities.

The black and red mangrove communities on the site span between Kiani Lagoon and Vieques Passage. The red mangroves are near open water where there is saturation/ inundation of seawater; the black mangroves are on higher land.

The red mangrove community is sparsely vegetated (approximately 25 percent cover) with large pools of open water. Nearly all vegetation included short shrubs of red mangrove; no other vegetation was observed in this community. Numerous red mangrove seedlings were also observed in this area.

The black mangrove community also had sparse (approximately 25 percent) vegetation cover. Plants were predominately short shrubs (8 to 15 feet); however, there were some patches of herbaceous vegetation located on higher topography. Black mangrove dominated the shrub vegetation, with white mangrove, mesquite, and sweet acacia also present. The herbaceous vegetation was dominated by seashore dropseed. Salt heliotrope, sea purslane, and bay flower were also identified (Table L-14).

A reference site was selected along the eastern boundary of SWMU 6 for plant community comparisons. The reference area was not known to contain solid waste material, and based on its relatively flat topography and groundwater flow direction from SWMU 6 not directed toward the reference area, there is no known transport pathway of contaminants from SWMU 6 to the vegetation in the reference site. The species composition and structures of the two sites were similar. The only difference was that the open areas of the black mangrove community in SWMU 6 were covered with debris. No stresses were observed in the plant communities.

L.2.4.3 Fauna

During the wildlife surveys, a number of birds and lizards were observed using the habitat of this site (Table L-15). The mangrove communities had significant crab activity, both land crab and fiddler crab, throughout the area. The red mangrove community, with more water present, had more crab holes than the black mangrove community. There was no visible evidence that the SWMU 6 site has an impact on the wildlife or habitat.

L.2.4.4 Rare, Threatened, and Endangered Species

Sixteen federally listed species are known to occur or have the potential to occur on the former NASD (Table L-16). Before the fieldwork was conducted, a literature search was performed for each federally protected species. During the May 15-19, 2000, surveys, biologists walked transects through SWMU 6, identified any federally protected species seen, and noted the presence or absence of preferred habitat for the species.

No federally protected species or preferred habitat were observed at this site. The federally endangered plant species cobana negra (*Stahlia monosperma*) is known to occur in coastal

forests of southeastern Puerto Rico (Little and Wadsworth, 1964). One of the two known cobana negra populations is located on the eastern boundary of Laguna Kiani, which is fairly close to SWMU 6. No individual cobana negra plants were found at SWMU 6. Although cobana negra has been found at the former NASD (in the boundary between black mangrove communities, salt flats, and the upland communities), the habitat at SWMU 6 is a mixed mangrove and thus not preferred habitat.

Brown pelicans and roseate terns, both federally endangered birds, would most likely not occur at the site but have been found adjacent to the site at Kiani Lagoon. During the surveys, brown pelicans were observed flying over the adjacent marine habitat but not at SWMU 6.

L.2.5 Summary of Available Analytical Data

Several investigations have been conducted onsite to evaluate the presence of contaminants from the historical disposal operations. These investigations included analyses of soil, groundwater, surface water, and sediments, as well as MEC avoidance surveys.

A confirmation study was conducted at SWMU 6 in 1988 to evaluate potential contamination from the historical Navy disposal activities (ESE, 1988). Five surface water, five sediment, and eight soil samples were collected and analyzed for pH, chromium, lead, VOCs, xylene, MEK, and MIBK. No groundwater samples were collected. The CS Report stated that no elevated levels of any of the constituents of concern, relative to human health criteria, were detected in the soil, surface water, and sediment samples collected, so no further investigation of the site was recommended.

In April and May 2000, CH2M HILL conducted an Expanded PA/SI investigation. The study included geophysical surveys, an MEC avoidance survey, installation and sampling of four monitoring wells, and collection of seven surface water, seven sediment, eight surface soil, and four subsurface soil samples. All samples were analyzed for metals, VOCs, SVOCs, pesticides, PCBs, and explosives. Metals were found to exceed human health and ecological screening criteria in all media, while some organic chemicals exceeded screening criteria in groundwater and surface soil.

A magnetometer survey was conducted to help delineate potential areas of buried metallic waste. From the survey, most ferrous metal debris appeared to be present in the northern portion of the site and under the road of the survey area. MEC technicians found no active items during visual site inspection or a magnetometer-aided survey at the sampling locations. Navy Explosive Ordnance Disposal (EOD) technicians examined two bomb dispensers at SWMU 6 and confirmed that they were empty and posed no hazard.

L.2.5.1 Preliminary Conceptual Model

A complete discussion on fate and transport pathways and the CSM is presented in Section 5. The CSM qualitatively defines the various contaminant sources, release mechanisms, relative rates of migration and persistence of contaminants, and migration pathways for contaminants at the site. Based on the available site information, a flow chart of the potential migration pathways, exposure pathways, potential human receptors, and potential ecological receptors was developed (Figure 5-1).

L.2.5.2 Potential Source Area

SWMU 6 was used by the former NASD for disposal of solid and generic waste during the 1960s and 1970s. Waste discarded at the site includes empty containers of lubricants, oil, solvents, and paints, broken glass, and rubble. No live MEC have been identified at SWMU 6. However, inactive MEC have been identified, such as inert concrete-filled practice bombs, empty bomb dispensers, and empty shell casings.

A geophysical survey was conducted at SWMU 6 to delineate the extent of the buried waste, as described in Section 3. The extent of the buried waste is primarily limited to surface deposits. Most ferrous metal debris is present in the northern portion of the site and under the road of the surveyed area.

L.2.5.3 Transport Pathways and Exposure Media

A transport pathway describes the mechanisms whereby chemicals may be transported from a source of contamination to ecologically relevant media. These transport pathways are shown on Figure 5-1.

The primary mechanism for contaminant transport from the source area at SWMU 6 is expected to be vertical migration. Contaminants in soil and buried waste materials may leach through the vadose zone and be transported into the groundwater system. Recharge to the groundwater aquifer primarily occurs through infiltration of rainfall. The movement of water through the unsaturated soil and buried waste can dissolve contaminants and strip them from waste materials, then transport them to the underlying groundwater, serving as a source of contaminants to groundwater. Surface water and sediment samples in the perimeter surface water body reflect locations of groundwater discharge from the site. Some of the factors that influence this process include the mobility of the detected chemical, the nature of the soils, rainfall and other climatological factors, and depth to groundwater.

Contaminants in site soil may be transported by surface runoff to surface water and sediment in the canal and possibly Kiani Lagoon. Contaminants transported in surface runoff can be present either in the dissolved phase or as suspended particulates, which can then settle out into sediment. Since the site is relatively flat, bermed along the western and northern portions, and vegetated, surface runoff is not expected to be a significant migration pathway.

Wind erosion is a possible mechanism for release of site contaminants to the atmosphere from soil. Inorganics, the primary contaminants at SWMU 6, and many SVOCs tend to bind to the soil and can be released to the atmosphere as dust during windy conditions. Typically, wet soils across the site along with vegetative cover limit dust emissions. Therefore, this migration/exposure pathway is not considered significant. Volatilization, the primary mechanism for releasing volatile contaminants from soil to the atmosphere, is not considered a significant part of potential contaminant release at the site.

L.2.5.4 Exposure Pathways and Routes

An exposure pathway links a source of contamination with one or more receptors through exposure via one or more media and exposure routes. Exposure, and thus potential risk, can occur only if one or more complete exposure pathways exist. Figure 5-1 shows the potentially complete exposure pathways to ecological receptors at SWMU 6.

Potentially complete exposure pathways to terrestrial receptors (e.g., mammals and birds) using the upland habitats on SWMU 6 exist (exposure to surface soils). Potentially complete exposure pathways to aquatic (e.g., benthic invertebrates and fish) and semi-aquatic (e.g., herons) receptors using the canal and lagoon water bodies also exist (exposure to surface water and sediment).

An exposure route describes the specific mechanism(s) by which a receptor is exposed to a chemical present in an environmental medium. Terrestrial plants may be exposed to chemicals present in surface soils through their root surfaces during water and nutrient uptake. No fully aquatic plants were observed in the canal; mangroves growing along the shoreline are exposed primarily to terrestrial soils.

Animals may be exposed to chemicals through:

Direct inhalation of gaseous chemicals or of chemicals adhered to airborne particulate matter;

Incidental ingestion of contaminated abiotic media (soil or sediment) during feeding or preening activities;

The direct ingestion of contaminated water;

The ingestion of contaminated plant and/or animal tissues for chemicals that have entered food webs; and/or

Dermal contact with contaminated abiotic media.

Based upon the general fate properties (relatively high adsorption to solids) of the chemicals present on SWMU 6 (primarily metals and PAHs) and the protection offered by hair or feathers, potential dermal exposures for upper trophic level receptors are not considered significant relative to ingestion exposures and are not evaluated in this ERA. Upper trophic level receptors considered in this ERA would not likely be exposed, via inhalation, to significant airborne sources of chemicals because the site is heavily vegetated and little wind erosion of the soils would be expected. Furthermore, the primary chemicals present on the site (metals and PAHs) typically adsorb to soil, suggesting that the potential for volatilization and thus exposure via inhalation is very limited. Incidental ingestion of soil or sediment during feeding, preening, or grooming activities is, however, considered in the risk estimates. Direct contact is considered for lower trophic level receptors (e.g., soil and benthic invertebrates).

Direct ingestion of drinking water is considered only when the salinity is below 15 parts per thousand, the approximate toxic threshold for wildlife receptors (Humphreys, 1988). The adjacent canal and lagoon is saline due to its proximity and direct connection to Vieques Passage and thus is not a reliable source of drinking water for wildlife.

L.2.5.5 Receptors

Because of the complexity of natural systems, it is generally not possible to directly assess the potential impacts to all ecological receptors present at a site. Therefore, specific receptor species or species groups (e.g., red-tailed hawk) are often selected as surrogates to evaluate potential risks to larger portions of the ecological community (guilds, e.g., carnivorous

birds) used to represent the assessment endpoints (e.g., survival and reproduction of carnivorous birds). Selection criteria typically include those species that:

Are known to occur, or are likely to occur, at the site.

Have a particular ecological, economic, or aesthetic value.

Are representative of taxonomic groups, life history traits, and/or trophic levels in the habitats present at the site for which complete exposure pathways are likely to exist.

Can, because of toxicological sensitivity or potential exposure magnitude, be expected to represent potentially sensitive populations at the site.

The following upper trophic level receptor species have been chosen for exposure modeling based upon the criteria listed above:

Norway rat (*Rattus norvegicus*) -- terrestrial mammalian omnivore
Indian mongoose (*Herpestes auropunctatus*) -- terrestrial mammalian omnivore
Pearly-eyed thrasher (*Margarops fuscatus*) -- terrestrial avian omnivore
Red-tailed hawk (*Buteo jamaicensis*) -- terrestrial avian carnivore
Green heron (*Butorides virescens*) -- wetland/aquatic avian piscivore
Spotted sandpiper (*Actitis macularia*) -- wetland/aquatic avian invertivore

Upper trophic level receptor species quantitatively evaluated in the ERA were limited to birds and mammals, the taxonomic groups with the most available information regarding exposure and toxicological effects. Because SWMU6 lacks significant habitat for amphibians and reptiles (compared to other environs on Vieques), these receptors were not evaluated.

Lower trophic level receptor species were evaluated in the ERA based upon those taxonomic groupings for which screening values have been developed; these groupings and screening values are used in most ERAs. As such, specific species of aquatic biota (e.g., fish and macroinvertebrates) were not chosen as receptors because of the limited information available for specific species and because these receptors were evaluated on a community level via a comparison to surface water and sediment screening values. Similarly, terrestrial plants and soil invertebrates were evaluated using soil screening values developed for these groups.

L.2.5.6 Endpoints and Risk Hypotheses

The conclusion of the screening problem formulation includes the selection of ecological endpoints and risk hypotheses, which are based upon the preliminary conceptual model. Two types of endpoints, assessment endpoints and measurement endpoints, are defined as part of the ERA process (EPA, 1997). An assessment endpoint is an explicit expression of the environmental component or value that is to be protected. A measurement endpoint is a measurable ecological characteristic that is related to the component or value chosen as the assessment endpoint. The considerations for selecting assessment and measurement endpoints are summarized in EPA (1997) and discussed in detail in Suter (1989, 1990, 1993). Risk hypotheses are testable hypotheses about the relationships among the assessment endpoints and their predicted responses when exposed to contaminants.

Endpoints define ecological attributes that are to be protected (assessment endpoints) and measurable characteristics of those attributes (measurement endpoints) that can be used to gauge the degree of impact that has or may occur. Assessment endpoints most often relate to attributes of biological populations or communities, and are intended to focus the risk assessment on particular components of the ecosystem that could be adversely affected by chemicals attributable to the site (EPA, 1997). Assessment endpoints contain an entity (e.g., heron population) and an attribute of that entity (e.g., survival rate). Individual assessment endpoints usually encompass a group of species or populations (the receptor) with some common characteristic, such as specific exposure route or contaminant sensitivity, with the receptor then used to represent the assessment endpoint in the risk evaluation.

Assessment and measurement endpoints may involve ecological components from any level of biological organization, from individual organisms to the ecosystem itself. Effects on individual organisms are important for some receptors, such as rare and endangered species; population- and community-level effects are typically more relevant to ecosystems. Population- and community-level effects are usually difficult to evaluate directly without long-term, extensive study. However, measurement endpoint evaluations at the individual level, such as an evaluation of the effects of chemical exposure on reproduction, can be used to predict effects on an assessment endpoint at the population or community level. In addition, criteria values designed to protect the majority (e.g., 95 percent) of the components of a community (e.g., National Recommended Water Quality Criteria for the Protection of Aquatic Life) can be useful in evaluating potential community- and/or population-level effects.

Table L-17 shows the preliminary assessment endpoints, risk hypotheses, and measurement endpoints used in the screening portion (Steps 1 and 2) of the ERA. Table L-17 also shows the receptors associated with each endpoint.

L.2.6 Screening Exposure Estimation

Maximum concentrations were used in the screening portion of the ERA to conservatively estimate potential chemical exposures for the ecological receptors selected to represent the assessment endpoints at SWMU 6. Food web exposures for upper trophic level receptor species were determined by estimating the chemical-specific concentrations in each dietary component using uptake and food web models. Incidental ingestion of soil or sediment was also included when calculating the total level of exposure. There is no freshwater at the site to serve as a drinking water source for upper trophic level receptors. Maximum sediment or surface soil concentrations were used in all screening food web calculations to provide a conservative assessment.

For conservatism, the maximum reporting limit for chemicals analyzed for but not detected was also compared to medium-specific screening values and (where applicable) used for food web exposure modeling. This was done to determine if reporting limits were less than or equal to chemical concentrations at which potential adverse effects to ecological receptors may occur.

L.2.6.1 Exposure Estimation

Upper trophic level receptor exposures (via the food web) to chemicals present in surface soil and sediment were determined by estimating the concentration of each bioaccumulating

chemical in each relevant dietary component. Incidental ingestion of soil or sediment was included when calculating the total exposure. Since receptors (and their prey) are not exposed directly to groundwater, food web exposures were not calculated based upon groundwater concentrations.

Only chemicals with the potential to bioaccumulate were evaluated for exposures via food webs. This list of bioaccumulating chemicals is provided in Table L-18 for relevant constituents and is based upon the list provided in EPA (2000).

Dietary items for which tissue concentrations were modeled included terrestrial plants, soil invertebrates, small mammals, benthic invertebrates, and fish. For the screening portion of the ERA, the uptake of chemicals from the abiotic media into these food items was based upon conservative (e.g., maximum or 90th percentile) bioconcentration factors (BCFs) or bioaccumulation factors (BAFs) from the literature. Default factors of 1.0 were used only when data for a chemical in the literature were unavailable.

L.2.6.2 Screening Exposure Point Concentrations

Maximum media concentrations were used as exposure point concentrations (EPCs) for exposure estimation and food web modeling in the screening portion of the ERA. EPCs (concentrations in plant, soil invertebrate, small mammal, benthic invertebrate, and fish prey items) for upper trophic level receptors were estimated using bioaccumulation models and maximum measured surface soil or sediment concentrations. The methodology and models used to derive these estimates are described below.

Terrestrial Plants. Tissue concentrations in the aboveground vegetative portion of terrestrial plants were estimated by multiplying the maximum surface soil concentration for each chemical by chemical-specific soil-to-plant BCFs obtained from the literature. The BCF values used were based upon root uptake from soil and upon the ratio between dry-weight soil and dry-weight plant tissue. Literature values based upon the ratio between dry-weight soil and wet-weight plant tissue were converted to a dry-weight basis by dividing the wet-weight BCF by the estimated solids content for terrestrial plants (15 percent [0.15]; Sample et al., 1997).

For inorganic chemicals without literature-based BCFs, a soil-to-plant BCF of 1.0 was assumed. For organic chemicals without literature-based BCFs, soil-to-plant BCFs were estimated using the algorithm provided in Travis and Arms (1988):

$$\log B_v = 1.588 - (0.578)(\log K_{ow})$$

where

B_v = soil-to-plant BCF (unitless; dry-weight basis)
K_{ow} = octanol-water partitioning coefficient (unitless)

The log K_{ow} values used in the calculations were obtained mostly from EPA (1995b, 1996a) and are listed in Table L-18. The soil-to-plant BCFs used in the screening portion of the ERA are shown in Table L-19.

Soil Invertebrates. Tissue concentrations in soil invertebrates (earthworms) were estimated by multiplying the maximum surface soil concentration for each chemical by chemical-specific BCFs or BAFs obtained from the literature. BCFs are calculated by dividing the concentration of a chemical in the tissues of an organism by the concentration of that same chemical in the surrounding environmental medium (in this case, soil) without accounting for uptake via the diet. BAFs consider both direct exposure to soil and exposure via the diet. Since earthworms consume soil, BAFs are more appropriate values and were used in the food web models when available. BAFs based upon depurated analyses (soil was purged from the gut of the earthworm prior to analysis) were given preference over undepurated analyses when selecting BAF values since direct ingestion of soil is accounted for separately in the food web model.

The BCF/BAF values used were based upon the ratio between dry-weight soil and dry-weight earthworm tissue. Literature values based upon the ratio between dry-weight soil and wet-weight earthworm tissue were converted to a dry-weight basis by dividing the wet-weight BCF/BAF by the estimated solids content for earthworms (16 percent [0.16]; EPA, 1993). For chemicals without available measured BAFs or BCFs, an earthworm BAF of 1.0 was assumed. The soil-to-earthworm BCFs/BAFs used in the screening portion of the ERA are shown in Table L-19.

Small Mammals. Whole-body tissue concentrations in small mammals (i.e., Norway rat for this site) were estimated using one of two methodologies. For chemicals with literature-based soil-to-small mammal BAFs, the small mammal tissue concentration was calculated by multiplying the maximum surface soil concentration for each chemical by a chemical-specific soil-to-small mammal BAF obtained from the literature. The BAF values used were based upon the ratio between dry-weight soil and whole-body dry-weight tissue. Literature values based upon the ratio between dry-weight soil and wet-weight tissue were converted to a dry-weight basis by dividing the wet-weight BAF by the estimated solids content for small mammals (32 percent [0.32]; EPA, 1993). The soil-to-small mammal BAFs used in the screening portion of the ERA are shown in Table L-19.

For chemicals without soil-to-small-mammal BAF values, an alternate approach was used to estimate whole-body tissue concentrations. Because most chemical exposure for small mammals occurs via the diet, it was assumed that the concentration of each chemical in the small mammal's tissues was equal to the chemical concentration in its diet, that is, a diet to whole-body BAF (wet-weight basis) of 1.0 was assumed. The use of a diet to whole-body BAF of 1.0 is likely to result in a conservative estimate of chemical concentrations for chemicals that are not known to biomagnify in terrestrial food webs (such as PAHs) based upon reported literature values for chemicals that are known to biomagnify in food webs. For example, a maximum BAF (wet-weight) value of 1.0 was reported by Simmons and McKee (1992) for PCBs based on laboratory studies with white-footed mice. Menzie et al. (1992) reported BAF values (wet-weight) for DDT of 0.3 for voles and 0.2 for short-tailed shrews.

Benthic Invertebrates. Tissue concentrations in benthic invertebrates were estimated by multiplying the maximum sediment concentration for each chemical by chemical-specific sediment-to-invertebrate BAFs obtained from the literature. The BAF values used were based upon the ratio between dry-weight sediment and dry-weight invertebrate tissue. BAFs based upon depurated analyses (sediment was purged from the gut of the organism

prior to analysis) were given preference over undepurated analyses when selecting BAF values since direct ingestion of sediment is accounted for separately in the food web model.

Literature values based upon the ratio between dry-weight sediment and wet-weight invertebrate tissue were converted to a dry-weight basis by dividing the wet-weight BAF by the estimated solids content for benthic invertebrates (21 percent [0.21]; EPA, 1993). For chemicals without literature-based sediment-to-invertebrate BAFs, a BAF of 1.0 was assumed. The sediment-to-invertebrate BAFs used in the screening portion of the ERA are shown in Table L-20.

Fish. Tissue concentrations in whole-body fish were estimated by multiplying the maximum sediment concentration for each chemical by chemical-specific sediment-to-fish BAFs obtained from the literature. The BAF values used were based upon the ratio between dry-weight sediment and dry-weight fish tissue. Literature values based upon the ratio between dry-weight sediment and wet-weight fish tissue were converted to a dry-weight basis by dividing the wet-weight BAF by the estimated solids content for fish (25 percent [0.25]; EPA, 1993). For chemicals without literature-based sediment-to-fish BAFs, a BAF of 1.0 was assumed. The sediment-to-fish BAFs used in the screening portion of the ERA are shown in Table L-20.

L.2.6.3 Dietary Intakes

Dietary intakes for each upper trophic level receptor species were calculated using the following formula (modified from EPA [1993]):

$$DI_x = \frac{[[\sum_i (FIR)(FC_{xi})(PDF_i)] + [(FIR)(SC_x)(PDS)] + [(WIR)(WC_x)]]}{BW}$$

where

DI_x = dietary intake for chemical x (mg chemical/kg body weight/day)
FIR = food ingestion rate (kg/day, dry-weight)
FC_{xi} = concentration of chemical x in food item i (mg/kg, dry-weight)
PDF_i = proportion of diet composed of food item i (dry-weight basis)
SC_x = concentration of chemical x in soil/sediment (mg/kg, dry-weight)
PDS = proportion of diet composed of soil/sediment (dry-weight basis)
WIR = water ingestion rate (L/day)
WC_x = concentration of chemical x in water (mg/L)
BW = body weight (kg, wet-weight)

Receptor-specific values used as inputs to this equation for the screening portion of the ERA are provided in Table L-21. Consistent with the conservative approach used for a SERA, the minimum adult body weight and maximum food ingestion rate from the scientific literature were used for each receptor (water ingestion was set to zero since the site lacks a reliable freshwater drinking source). It was assumed that chemicals were 100 percent bioavailable to the receptor and that each receptor spent 100 percent of its time on the site (i.e., an area use factor [AUF] of 1.0 was assumed).

L.2.7 Screening Effects Evaluation

The purpose of the screening effects evaluation is to establish chemical exposure levels (screening values) that represent conservative thresholds for adverse ecological effects. One set of screening values is typically developed for each selected assessment endpoint.

L.2.7.1 Medium-Specific Screening Values

Medium-specific screening values were established for each ecologically relevant medium. Screening value sources were based on prior agency recommendations following review of the workplan. Based upon the preliminary conceptual model, direct exposures to surface soil, surface water, and sediment are potentially complete pathways at SWMU 6.

The soil screening values used are from the Oak Ridge National Laboratory, which has identified soil screening values specific to soil invertebrates and microbial processes (Efroymson et al., 1997a) and terrestrial plants (Efroymson et al., 1997b). Where screening values were available for multiple receptors in these references, the most conservative value was chosen. In some instances where soil screening values were not available from these references, three other references were consulted: the Canadian protocol for deriving environmental soil quality guidelines (SQGs; CCME, 1996), Dutch Soil Quality Standards (MHSPE, 1994), and U.S. Fish and Wildlife Service soil screening values presented by Beyer (1990). The lowest screening value from these three sources was selected for screening.

The surface water screening values used were the more stringent values from two sources: the Puerto Rico Water Quality Standards Regulation (PREQB, 2003) and the U.S. National Recommended Water Quality Criteria (NRWQC) for the protection of aquatic life (EPA, 2002). Surface water at SWMU 6 is saline, so chronic NRWQC for saltwater were used. Similarly, the Puerto Rico standards identified for coastal/estuarine waters were used in the assessment.

The sediment screening values were selected from NOAA publications (Long and Morgan, 1990; Long et al., 1995) and the State of Florida (MacDonald, 1994). The selected screening value is the lower of the effects range-low (ERL; Long et al., 1995) and threshold effect level (TEL; MacDonald et al., 1996). In cases where the Contract Laboratory Program's (CLP) practical quantitation limit (PQL) is above the screening value, the screening value defaults to the PQL (EPA, 1995).

L.2.7.2 Ingestion Screening Values

Ingestion screening values for dietary exposures were derived for each mammalian and avian receptor species and chemical evaluated in the ERA. Toxicological information from the literature for wildlife species most closely related to the receptor species was used, when available, and was supplemented by laboratory studies of non-wildlife species (e.g., chickens and laboratory rats) when necessary. The ingestion screening values are expressed as milligrams of the chemical per kilogram body weight of the receptor per day (mg/kg-BW/day).

Growth and reproduction were emphasized as assessment endpoints because they are the most relevant, ecologically, to maintaining viable populations and because they are generally the most studied chronic toxicological endpoints for ecological receptors. If several chronic toxicity studies were available from the literature, the most appropriate study was

selected for each receptor species based upon study design, study methodology, study duration, study endpoint, and test species. No Observed Adverse Effect Levels (NOAELs) based on growth and reproduction were used, when available, as the primary screening values. When chronic NOAEL values were unavailable, estimates were extrapolated from chronic Lowest Observed Adverse Effect Levels (LOAELs) using an uncertainty factor of 10. Ingestion screening values for mammals and birds are summarized in Tables L-22 and L-23, respectively.

L.2.8 Screening Risk Calculation

The screening risk calculation is the final step in a SERA. In this step, the maximum exposure concentrations (abiotic media) or exposure doses (upper trophic level receptor species) are compared with the corresponding screening values to derive screening risk estimates. The outcome of this step is a list of COPCs for each medium-pathway-receptor combination evaluated or a conclusion of acceptable risk.

L.2.8.1 Selection of Chemicals of Potential Concern (COPCs)

COPCs are selected using the hazard quotient (HQ) method. HQs are calculated by dividing the chemical concentration in the medium being evaluated by the corresponding medium-specific screening value or by dividing the exposure dose by the corresponding ingestion screening value. Detected chemicals with HQs greater than or equal to 1.0 are considered COPCs in the SERA. Detected chemicals for which toxicological data were not available were also identified as COPCs in the SERA. Undetected chemicals with maximum reporting limits that exceeded screening values are addressed in the "Uncertainties" subsection. Undetected chemicals without available screening values were not identified as COPCs.

HQs exceeding 1.0 indicate the potential for risk since the chemical concentration or dose (exposure) exceeds the screening value (effect). However, screening values and exposure estimates are derived using intentionally conservative assumptions such that HQs greater than or equal to 1.0 do not necessarily indicate that risks are present or impacts are occurring. Rather, such HQs identify chemical-pathway-receptor combinations requiring further evaluation. HQs less than 1.0 indicate that risks are very unlikely, so that a conclusion of no unacceptable risk can be reached with high confidence.

L.2.8.2 Surface Soil

Maximum surface soil concentrations are compared to screening values in Table L-24. Based upon this comparison, 10 metals (aluminum, antimony, chromium, copper, iron, lead, manganese, thallium, vanadium, and zinc), 3 pesticides (DDD, DDE, DDT), and 7 PAHs had HQs equaling or exceeding 1.0 based upon detected concentrations and were identified as COPCs. In addition, 1 pesticide, 10 SVOCs, and 6 VOCs were retained as COPCs since screening values were not available for comparison to detected concentrations.

L.2.8.3 Surface Water

Maximum surface water concentrations are compared to screening values in Table L-25. Based upon this comparison, 6 metals (arsenic, copper, lead, mercury, dissolved nickel, and silver) had an HQ equaling or exceeding 1.0 based upon detected total or dissolved (filtered)

concentrations and were identified as COPCs. In addition, seven detected metals and one phthalate were retained as COPCs since screening values were not available for comparison.

L.2.8.4 Sediment

Maximum sediment concentrations are compared to screening values in Table L-26. Based upon this comparison, 10 metals (antimony, arsenic, barium, cadmium, copper, lead, mercury, nickel, silver, and zinc), 3 pesticides (DDD, DDE, and DDT) and 1 phthalate had HQs equaling or exceeding 1.0, based upon detected concentrations and were identified as COPCs. In addition, eight metals and six VOCs were retained as COPCs since screening values were not available for comparison to detected concentrations.

L.2.8.5 Food Web Exposures

HQs based upon maximum exposure doses for each upper trophic level receptor are listed in Table L-27. Based upon a comparison to NOAELs, eight metals (arsenic, cadmium, chromium, copper, lead, mercury, selenium, and zinc) and two pesticides (DDD and DDE) had HQs equaling or exceeding 1.0 for one or more receptors and were identified as COPCs. Three pesticides and six PCBs were retained as COPCs because the maximum reporting limits exceeded screening values.

Ingestion screening values were not available for avian receptors for three organic chemicals (hexachlorocyclopentadiene, hexachloroethane, and 1,1,2,2-tetrachloroethane), and ingestion screening values were not available for mammalian and avian receptors for two organic chemicals (4-bromophenyl-phenylether and 4-chlorophenyl-phenylether). None of these five chemicals were detected on the site and therefore none were identified as COPCs.

L.2.9 Screening Risk Conclusions

COPCs were identified in surface soil, surface water, and sediment at SWMU 6, as well as from food web exposures. These COPCs are listed in Table L-28.

L.2.10 Baseline Ecological Risk Assessment

The SERA resulted in a set of COPCs for each medium evaluated. This set of COPCs includes chemicals with HQs equaling or exceeding 1.0 (based upon maximum exposures) and detected chemicals for which toxicological data (screening values) were not available.

L.2.11 Refinement of Conservative Screening Assumptions

Step 3 initiates the problem formulation phase of the BERA. The BERA begins with a preliminary step (Step 3A) in which the conservative assumptions used in the SERA are refined and risk estimates are recalculated using the same conceptual model for the site. In addition, the refinement may include consideration of other factors such as upgradient and background data, detection frequency, and chemical-specific bioavailability.

The assumptions, parameter values, and methods that were modified for the Step 3A refinement included:

Risk estimates based upon maximum chemical concentrations in media were supplemented by risk estimates based upon average (arithmetic mean) chemical concentrations. In addition, BAFs and BCFs were based upon, or modeled from, central tendency estimates

(e.g., median or mean) from the literature as opposed to the maximum or "high-end" (e.g., 90th percentile) estimates used in the SERA for many chemicals. Revised BAF/ BCF values used in Step 3A are provided in Tables L-29 and L-30.

> In the BERA, using central tendency estimates (rather than high-end or maximums) for exposure parameters such as BAFs provides a more representative estimate of potential exposures and risks to receptor populations (the focus of the assessment endpoints) of upper trophic level receptors. Because these upper trophic level species are highly mobile, they would be expected to effectively average their exposure over time as they forage within the area defining their home range (which will extend to offsite areas). Average prey concentrations at Step 3A are most appropriately estimated using central tendency estimates of media concentrations and accumulation factors. For example, the wildlife dietary exposure models contained in the Wildlife Exposure Factors Handbook (EPA, 1993) specify the calculation of an average daily dose. Increasing the representativeness of the exposure estimates relative to population-level effects is consistent with the intent of the Step 3A refinement. In cases where adequate spatial sampling coverage exists, mean concentrations are also appropriate for evaluating potential risks to populations of lower trophic level receptors because the members of the population are expected to be found throughout a site (where suitable habitat is present), rather than concentrated in one particular area. While effects on individual organisms might be important for some receptors, such as rare and endangered species, population- and community-level effects are typically more relevant to ecosystems. A discussion of the uncertainties associated with the number of available samples and their spatial distribution is presented in the "Uncertainties" subsection.

Central tendency estimates (e.g., mean, median, midpoint) for body weight and ingestion rate (Table L-31) were used to develop exposure estimates for upper trophic level receptors, rather than the minimum body weights and maximum ingestion rates used in the SERA. Central tendency estimates for these exposure parameters are more relevant for a BERA because they better represent the characteristics of a greater proportion of the individuals in the population. Populations (rather than individual organisms) were emphasized during the development of the assessment endpoints for the ERA.

The SERA conservatively identified a chemical as a food web COPC if the estimated dose for at least one upper trophic level receptor exceeded the NOAEL. The actual dose that is protective of an individual receptor, however, will fall between the NOAEL and the LOAEL. Both the NOAEL and LOAEL were used for comparison in the BERA.

Site-specific upgradient concentrations and basewide background concentrations were also considered in the refinement. Basewide soil background values were used for soil, and two upgradient samples (NDW06SW10 and NDW06SW11) were used for surface water and sediment background comparisons.

EPA guidance (EPA, 1996b) indicates that the dissolved metal fraction should be preferentially used to the total metal fraction in surface water screening. For conservatism, total metal concentrations were included in the SERA for the surface water screen. Since high levels of suspended solids and sediment-adsorbed metals could result in overstating bioavailable surface water concentrations (and thus potential exposures and risks), filtered metal concentrations (representing the dissolved fraction) in surface water were also

evaluated through a comparison to screening values based upon the dissolved metal fraction.

Only complete, critical pathways identified in the SERA were reevaluated in Step 3A of the ERA. Similarly, only COPCs and receptors identified in the SERA as requiring further evaluation were addressed in Step 3A. Although many aspects of the estimation of exposure were modified in Step 3A (see above), the screening values (effects) used in Step 3A were the same as the values used in the SERA, unless there was adequate justification available to provide an alternate screening value. Although the same basic conceptual model from the SERA was also used in Step 3A, the endpoints and risk hypotheses from the SERA were modified slightly to better reflect the Step 3A analysis (Table L-32).

L.2.12 Refined (Step 3A) Risk Characterization

Based upon the results of the SERA, the assessment endpoints, measurement endpoints, and risk hypotheses were modified for the Step 3A refinement (Table L-32). Modifications included changing the measurement endpoints to reflect the assumptions and methods used in the Step 3A refinement. The results of the refined risk characterization are discussed in the following subsections.

L.2.12.1 Surface Soil

Mean chemical concentrations in surface soils from SWMU 6 are compared with screening values in Table L-33. Based upon this comparison, eight metals (aluminum, chromium, copper, iron, lead, manganese, vanadium, and zinc), three pesticides (DDD, DDE, DDT), and six PAHs had mean HQs that equaled or exceeded 1.0 and were identified as preliminary chemicals of concern (PCOCs). One pesticide, ten SVOCs, and six VOCs were carried forward as PCOCs into the risk evaluation due to lack of screening values.

For bis(2-ethylhexyl)phthalate an alternate literature source was evaluated. Detections of bis(2-ethylhexyl)phthalate did not exceed the screening value of 10 mg/kg (IPCS, 1992), thus it was not carried forward as a PCOC.

L.2.12.2 Surface Water

Mean chemical concentrations in surface water from the lagoon system are compared with screening values in Table L-34. Six metals (arsenic, copper, lead, mercury, dissolved nickel, and silver) had mean HQs that equaled or exceeded 1.0 based upon detected total or dissolved (filtered) concentrations and were identified as PCOCs. In addition, seven detected metals and one phthalate were retained as COPCs, since screening values were not available for comparison.

L.2.12.3 Sediment

Mean chemical concentrations in lagoon system sediments are compared with screening values in Table L-35. Based upon this comparison, three metals (arsenic, barium, and copper), three pesticides (DDD, DDE, and DDT), and bis(2-ethylhexyl)phthalate had mean HQs that exceeded 1.0 and were identified as PCOCs. Antimony, cadmium, lead, mercury, nickel, silver, and zinc were eliminated as COPCs due to the mean HQs less than 1.0. Most of these metal exceedance occurred in one sample (NDA043) indicating that these metals may be problematic only in isolated piles of debris.

Eight metals and eight VOCs did not have screening values based on the initial literature sources, however alternate literature sources were evaluated, from which screening values were identified for six of the metals. Apparent Effects Threshold (AET) values were available from NOAA SQUIRT tables (NOAA, 1999) for aluminum– 18,000 mg/kg; cobalt – 10 mg/kg; iron – 220,000 mg/kg; manganese – 260 mg/kg; selenium – 1.0 mg/kg; and vanadium – 57 mg/kg. Mean sediment concentrations for cobalt and selenium exceeded these screening values and were carried forward as PCOCs, while the remaining four metals were below screening values.

Based on the above information, two metals (beryllium and thallium) and eight VOCs are carried forward as PCOCs into the risk evaluation due to lack of screening values.

L.2.12.4 Food Web Exposures

HQs based upon average exposure doses for each upper trophic level receptor are listed in Table L-36. Based upon a comparison to NOAELs, mercury, selenium, and zinc had HQs that equaled or exceeded 1.0 for a terrestrial (zinc) or semi-aquatic (mercury and selenium) receptor. HQs based on the LOAEL were above 1.0 for selenium only (spotted sandpiper).

L.2.13 Risk Evaluation

The potential for adverse effects associated with the PCOCs identified above and in Tables L-33 through L-36 are evaluated in this section. The goal of this evaluation is to finalize a list of COCs.

L.2.13.1 Surface Soil Exposures

Eight metals (aluminum, chromium, copper, iron, lead, manganese, vanadium, and zinc) were identified as PCOCs in surface soils from SWMU 6. Onsite surface soil concentrations for these metals are compared to background surface soil concentrations in Table L-37. Background data were not available for organic chemicals.

Aluminum, chromium, manganese, and vanadium did not exceed the background upper tolerance limit (UTL) in any sample, so these soil metals are consistent with background.

Iron exceeded the background UTL in only 2 of 23 samples, so iron across most of the site is comparable to background. The site average iron concentration of 18,500 mg/kg is slightly above the average background of 16,884 mg/kg. Although the average iron concentration for the site exceeded the screening value (mean HQ of 93), the potential risk associated with iron is likely to be low given the similarity to background soil conditions.

Copper exceeded background concentrations in 5 of the 23 site samples, and exceeded the soil screening value in 6 of 23 samples. This metal is not widespread in surface soil across the site, but is directly associated with some piles of debris at SWMU 6. The maximum HQ for copper was 6, whereas the mean HQ was 1.1. These data indicate that potential risks associated with copper are low, based on comparison with background, and limited and low magnitude of screening value exceedances.

The mean HQ for zinc at this site was 2.0. The screening value of 50 mg/kg for zinc is protective of plants; however, vegetation throughout the site is comparable to reference plant communities. The Oak Ridge National Laboratory provides other screening values

protective of soil microorganisms (100 mg/kg) and soil invertebrates (200 mg/kg) which are more appropriate for site conditions. Considering these two screening values, maximum HQs for zinc would range from 4.4 to 2.2, and mean HQs would be less than 1.0. Based on the low magnitude of screening value exceedances for plants, soil invertebrates, and microbial communities, risk associated with zinc is likely to be low; thus, it will not be considered further as a PCOC.

The mean HQ for lead at this site was 1.6. The screening value of 50 mg/kg for lead is protective of plants; however, vegetation throughout the site is comparable to reference plant communities. The Oak Ridge National Laboratory provides other screening values protective of soil invertebrates (500 mg/kg) and soil microorganisms (900 mg/kg) which are more appropriate for site conditions. Considering these two screening values, maximum HQs for zinc would range from 1.2 to 0.7, and mean HQs would be less than 1.0. Based on the low magnitude of screening value exceedances for plants, soil invertebrates, and microbial communities, risk associated with lead is likely to be low; thus, it will not be considered further as a PCOC.

The pesticides DDD, DDE, and DDT were identified as PCOCs. These chemicals exceeded soil screening values in 4 to 9 of the 23 soil samples, with mean HQs ranging from 2.9 to 5.4. The screening value of 0.0025 mg/kg for total DDD/DDE/DDT is a Target Value (MHSPE, 1994) which is scientifically based on standards for surface water and drinking water. The Ministry of Housing, Spatial Planning, and Environment has also identified an Intervention Value of 4.0 mg/kg for DDD/DDE/DDT, which is based on ecological effects. None of the samples collected from SWMU 6 contained total DDD/DDE/DDT in excess of the intervention value. The risk associated with direct exposure to these pesticides is likely to be low considering the low magnitude of exceedance of the screening value (Target Value), and lack of exceedance of the Intervention Value.

Six PAHs were identified as PCOCs (acenaphthalene, anthracene, fluoranthene, naphthalene, phenanthrene, and pyrene). These PAHs had a low frequency of screening value exceedance, ranging from 1 to 4 samples of 23 total samples. Mean HQs were also low, ranging from 2.8 to 4.5. The maximum detected concentrations of these PAHs all occurred in sample NDA111 (Station NDW06SS05), indicating that elevated PAHs occur in association with a few debris piles at the site and are thus not widespread. Total PAHs, calculated as the sum of all PAHs analyzed in a soil sample (including nine PAHs which had no screening values available), were undetected in 14 of the 23 samples, and exceeded the screening criterion in 9 of these samples. If an individual PAH compound was not detected in a sample, one-half of the reporting limit was used in calculating the total PAHs for that sample. Based on the low magnitude and frequency of criteria exceedances for individual and total PAHs across this site, the risk associated with PAHs is likely to be low.

L.2.13.2 Surface Water Exposures

Six metals (arsenic, copper, lead, mercury, dissolved nickel, and silver) were identified as PCOCs due to screening value exceedances. An additional seven metals and di-n-octylphthalate were considered PCOCs due to lack of screening values. Onsite concentrations of these parameters are compared to concentrations in two upgradient surface water samples (NDW06SW10 and NDW06SW11) in Table L-38. Barium was

comparable to upgradient conditions; otherwise, the metals and phthalate all exceeded upgradient sample concentrations.

Most of the metals were detected only in the unfiltered (total) surface water samples from the site. These included aluminum, arsenic, cobalt, copper, iron, lead, mercury, silver, thallium, and vanadium. Since these metals were not detected in any of the filtered (dissolved) surface water samples, they are not readily bioavailable to directly exposed aquatic organisms. As a result, these undetected dissolved metals will not be considered further as PCOCs.

Manganese was detected in both total and dissolved surface water samples. No screening value was available for manganese. Compared to upgradient surface water samples in which manganese was also detected (Table L-38), the magnitude of the difference is low; total and dissolved manganese had mean ratios of 2.0 and 1.8, respectively.

Dissolved nickel was detected in a single surface water sample, although total nickel was not detected in the same sample. The mean HQ for dissolved nickel was low at 2.0. Nickel (total or dissolved) was not detected in any other surface water sample upgradient or downgradient from the single station where it was detected, indicating limited distribution in the lagoon system.

Di-n-octylphthalate was detected in a single surface water sample. No screening value is available for this chemical, which is a common laboratory contaminant.

L.2.13.3 Sediment Exposures

Three metals (arsenic, barium, and copper), three pesticides (DDD, DDE, and DDT), and bis(2-ethylhexyl)phthalate were identified as PCOCs due to screening value exceedances. Eight additional metals and eight VOCs were carried forward as PCOCs due to lack of screening values. Onsite concentrations of these parameters are compared to concentrations in two upgradient sediment samples (NDW06S15 and NDW06SD16) in Table L-39. Ratios were developed for comparing maximum and mean site concentrations with maximum and mean upgradient sediment concentrations. These data indicate that all inorganic and organic chemicals evaluated exceeded upgradient concentrations.

The maximum detected concentrations for most of the metals occurred at Station NDW06SD02 during the April 2000 sampling event. These metals included antimony, arsenic, barium, beryllium, cadmium, cobalt, copper, lead, mercury, nickel, selenium, silver, thallium, and vanadium. This station is located at the edge of a metal bridge crossing for Highway 200, at the southwest corner of the site. In September 2003, this station was resampled to verify these elevated detections; the station was found to contain significantly lower metal concentrations than previously detected. In fact, all concentrations of these metals at this station were at or below background, and were below screening values where available. Additional sediment samples were also collected in September 2003 in the immediate vicinity of NDW06SD02, including NDW06SD10, -11, -12, and –13, and analytical results were comparable among these stations. Therefore, it appears that the sediment sample collected at NDW06SD02 in April 2000 does not accurately represent sediment metal concentrations at this location, and that the more recent re-sample data should be considered more appropriate for this station.

Arsenic, barium, and copper each exceeded screening values and upgradient concentrations. Mean HQs for these metals were relatively low, ranging from 1.6 to 4.6. The prior discussion regarding the maximum concentrations of metals and representativeness of the April 2000 sediment data from Station NDW06SD02 applies also to these parameters. Removal of the maximum concentrations of arsenic (555 mg/kg), barium (571 mg/kg), and copper (101 mg/kg), each occurring at Station NDW06SD02, results in lower maximum and average concentrations for consideration in this risk evaluation. The maximum and average concentrations for arsenic would be 13.5 mg/kg and 4.26 mg/kg, respectively; the maximum and average concentrations for barium would be 17.3 mg/kg and 9.39 mg/kg, respectively; and the maximum and average concentrations for copper would be 82 mg/kg and 26.06 mg/kg, respectively. Mean HQs for arsenic and barium would be less than 1.0 under these conditions, and the mean HQ for copper would be 1.4. In addition, considering an alternate screening value for copper (ERL = 34 mg/kg), the mean sediment concentration of 30 mg/kg would result in an HQ less than one. These three metals will not be considered further as PCOCs based on low magnitude of exceedance and consideration of elevated concentrations at one location which appear to be non-representative of site conditions.

No screening values were available for beryllium and thallium so potential toxicity of these metals could not be quantitatively evaluated.

Three pesticides, DDD, DDE, and DDT, each exceeded screening values with mean HQs ranging from 1.3 to 13. The frequency of screening value exceedance was low, ranging from 1 to 3 samples (of 17 to 18 samples) for these pesticides. The screening value of 0.0033 mg/kg is based on the PQL, as described previously. The PQL was selected because it was greater than the NOAA ERL value of 0.002 mg/kg for DDD and DDE, and the ERL value of 0.001 for DDT. In this risk evaluation, the NOAA effects range-median values (ERMs) are considered as well. For DDD, DDE, and DDT the ERMs are 0.020, 0.027, and 0.007 mg/kg, respectively. Mean HQs, based on ERMs as screening values, are as follows: DDD = 2.2, DDE = 1.1, and DDT = 0.6. Based on the low frequency of screening value (PQL) exceedance, and low magnitude of ERM screening value exceedance, these pesticides will not be considered further as PCOCs.

Six VOCs were identified as PCOCs since screening values were not available, and therefore these chemicals could not be evaluated quantitatively. Many of these VOCs are common laboratory contaminants, and since they are not likely related to solid waste materials discarded at the site, may be artifacts of sample handling.

L.2.13.4 Food Web Exposures

Selenium was identified as a PCOC since the NOAEL HQ (13.1) and LOAEL HQ (6.5) were both greater than 1.0 for the spotted sandpiper. This level of risk is driven by the maximum detection of selenium, 544 mg/kg (Station NDW06SD02), which occurred during the first round of sediment sampling on April 13, 2000. A repeat sample collected at the same location on September 3, 2003, resulted in a non-detection for selenium (0.252 U mg/kg). In addition, the next lowest concentration detected in all 19 sediment samples from the surrounding lagoon system was 2.2 mg/kg. Therefore, based on the repeat sample along with upgradient/downgradient sediment samples, the initial high detection of selenium is isolated and does not appear to accurately represent site conditions. The selenium concentrations (maximum and mean) used in the food web model may greatly overestimate

the exposure to semi-aquatic bird species. Calculation of food web exposure to selenium without the 544-mg/kg concentration results in NOAEL and LOAEL HQs less than 1.0.

Based on the evaluation above, selenium is not considered to pose an unacceptable risk to upper trophic level wildlife.

L.2.13.5 DOI Crab Sample Collection at SWMU 6

The DOI collected and chemically analyzed two individual land crab (*Cardisoma quanhumi*) samples and one composite fiddler crab (*Uca* sp.) sample from SWMU 6 and reported the tissue analytical results (DOI, 2002). The DOI's apparent purpose for the crab tissue sampling was a concern that wildlife resources may be impacted by the presence of site-related contaminants. There are, however, several limitations associated with the reported information that restrict incorporation of the tissue data into the SWMU 6 RI ecological risk assessment. Some of the limitations are as follows:

The limited applicability of the reference location (St. Croix, U.S. Virgin Islands).

The low sample sizes (2 land crabs, 1 fiddler crab).

The lack of location-specific information on where samples were collected, which does not allow an evaluation of their representativeness.

The lack of co-located media concentrations to put the data in perspective (i.e., Are these tissue data from the most contaminated portion of the site, the least, somewhere in between?).

Lack of context in the form of a conceptual site model of exposures. For example, there is no discussion on the home range of the crab species relative to the site size, the areas of the SWMUs with elevated chemical concentrations, the locations of the crab tissue samples, and what specific wildlife receptors would forage on crabs at the sites.

The limited and unreferenced "effects" assessment, which does not focus on the key receptors and pathways. Also, there is no attempt to put the tissue residues in perspective (except for the reference site comparison, which has limited applicability due to the distant location of the reference site) in terms of potential effects on the crabs themselves (i.e., comparison to applicable tissue residue effect levels from the literature).

The end result is that the DOI conclusions are unsupported. While the data show that the crabs are exposed to site-related chemicals, it does not provide the information and analysis to show that these exposures result in unacceptable risks to the crabs or the receptors that feed upon them.

The chemical concentrations detected by the DOI in the crab tissues are not at levels that would likely pose an unacceptable risk to birds foraging at the site. Chemicals of potential concern in crab tissues identified by the DOI include DDE, DDT, cadmium, lead, and vanadium. A conservative back-calculation using the food web model from the SWMU 6 ERA (as presented in this RI report) was used to conservatively estimate the highest concentrations of these chemicals in crab tissue that would pose no adverse effects to three species of wading bird, the great blue heron, yellow-crowned heron, and green heron. A key

assumption of the model was that the diets of these birds consisted entirely of crabs (i.e., no fish).

The food web model results indicated that for both DDE and DDT, no adverse effects would likely occur to these bird species consuming crabs with tissue concentrations at or below 1.03 mg/kg dry weight (wt). Maximum DDE and DDT concentrations measured by the DOI in crabs were less, equaling 0.52 and 0.11 mg/kg, respectively. For cadmium, lead, and vanadium, the model indicated that no adverse effects would occur at respective crab tissue concentrations of 5.0, 13.3, and 39.5 mg/kg dry wt. Maximum concentrations measured in crabs by the DOI were less than these values (cadmium = 1.6 mg/kg dry wt; lead = 11.7 mg/kg dry wt; vanadium = 2.63 mg/kg dry wt).

Therefore, despite the technical issues and uncertainties with the crab tissue samples, concentrations detected in the crab tissues are not at levels that would likely pose an unacceptable risk to birds foraging at the site.

L.2.13.6 Summary of COCs

In summary, none of the COPCs carried forward from Step 2 were considered as final COCs, following the Step 3A refinement. Although many metals and some organic chemicals were identified as COPCs, risks to lower trophic level receptors were negligible based on the low magnitude of screening value exceedances and comparisons to background/upgradient data. There were also no significant risks identified for terrestrial wildlife.

L.2.14 Uncertainties

Uncertainties are present in all risk assessments because of the limitations of the available data and the need to make certain assumptions and extrapolations based upon incomplete information. As noted previously, one of the most significant sources of uncertainty is associated with where the soil samples were collected that were used to assess the levels of contamination and the potential risks they pose. Because soil samples were collected primarily adjacent to waste piles instead of directly through them, it is possible that the soil constituent concentrations may have been underestimated in the area of contamination. This, then, may have affected the COPC selection and, ultimately, the levels of risks calculated for the various exposure scenarios. However, as noted previously, a new risk assessment will be performed (as part of the removal action) that includes soil samples collected from within the excavation, which will address this uncertainty. The uncertainty in this ERA is also attributable to the following factors:

Reporting Limits -- Reporting limits for some undetected analytes exceeded applicable screening values in some media. Because these chemicals were not detected, they are not known to be present on the site but the potential for unacceptable risks cannot be totally discounted because the reporting limits are higher than the screening values. Because standard analytical methods were used and the sample reporting limits were not elevated (except for toxaphene in surface water) relative to the method reporting limits, these uncertainties are considered to be acceptable.

Selection of COPCs -- Chemicals without available screening values for a medium were not retained as COPCs in the SERA portion of the assessment unless they were detected. This

could result in an underestimation of risks if these chemicals are actually present on the site at ecologically significant concentrations.

Evaluation of Soils -- The quantitative evaluation of chemical concentrations in soils was restricted to surface soils from the 0- to 6-inch depth range, where the highest exposures for most ecological receptors would be expected to occur.

Ingestion Screening Values -- Data on the toxicity of many chemicals to the receptor species were sparse or lacking, requiring the extrapolation of data from other wildlife species or from laboratory studies with non-wildlife species. This is a typical limitation and extrapolation is often used for ecological risk assessments because so few wildlife species have been tested directly for most chemicals. The uncertainties associated with toxicity extrapolation were minimized through the selection of the most appropriate test species for which suitable toxicity data were available. The factors considered in selecting a test species to represent a receptor species included taxonomic relatedness, trophic level, foraging method, and similarity of diet.

A second uncertainty related to the derivation of ingestion screening values applies to metals. Most of the toxicological studies on which the ingestion screening values for metals were based used forms of the metal (such as salts) that have high water solubility and high bioavailability to receptors. Since the analytical samples on which site-specific exposure estimates were based measured total metal, regardless of form, and these highly bioavailable forms are expected to compose only a fraction of the total metal concentration, this is likely to result in an overestimation of potential risks for these chemicals.

A third source of uncertainty associated with the derivation of ingestion screening values concerns the use of uncertainty factors. For example, NOAELs were extrapolated to LOAELs using an uncertainty factor of 10. This approach is likely to be conservative since Dourson and Stara (1983) determined that 96 percent of the chemicals included in a data review had LOAEL/NOAEL ratios of 5 or less. The use of an uncertainty factor of 10, although potentially conservative, also serves to counter some of the uncertainty associated with interspecies extrapolations, for which a specific uncertainty factor was not used.

Chemical Mixtures -- Information on the ecotoxicological effects of chemical interactions is generally lacking, which required (as is standard for ERAs) that the chemicals be evaluated on a compound-by-compound basis during the comparison to screening value. This could result in an underestimation of risk (if there are additive or synergistic effects among chemicals) or an overestimation of risks (if there are antagonistic effects among chemicals).

Food Web Exposure Modeling -- Chemical concentrations in terrestrial and aquatic food items (plants, earthworms, small mammals, benthic invertebrates, and fish) were modeled from measured media concentrations and were not directly measured. The use of generic, literature-derived exposure models and bioaccumulation factors introduces some uncertainty into the resulting estimates. The values selected and methodology used were intended to provide a conservative (SERA) or realistic (Step 3A) estimate of potential food web exposure concentrations.

Another source of uncertainty is the use of default assumptions for exposure parameters such as BCFs and BAFs. Although BCFs or BAFs for many bioaccumulative chemicals were readily available from the literature and were used in the ERA, the use of a default factor of 1.0 to estimate the concentration of some chemicals in receptor prey items is a source of uncertainty.

Area use factors were assumed to equal 1.0. This is a conservative assumption since a significant percentage of each upper trophic level receptor species time could be spent foraging offsite in unimpacted areas or areas where chemical concentrations are expected to be significantly lower.

Total Versus Dissolved Metals -- EPA guidance (EPA, 1996b) indicates that the dissolved metal fraction should be preferentially used to the total metal fraction in surface water screening. Both total and dissolved concentrations were used in the ERA for the surface water screen. High levels of suspended solids and sediment-adsorbed metals would result in overstating bioavailable water concentrations and thus potential exposures and risks.

Mean Versus Maximum Media Concentrations -- As is typical in an ERA, a finite number of samples of environmental media are used to develop the exposure estimates. The maximum measured concentration provides a conservative estimate for immobile biota or those with a limited home range. The most realistic exposure estimates for mobile species with relatively large home ranges and for species populations (even those that are immobile or have limited home ranges) are those based upon the mean chemical concentrations in each medium to which these receptors are exposed. This is reflected in the wildlife dietary exposure models in the Wildlife Exposure Factors Handbook (EPA, 1993), which specify the use of average media concentrations. Given the mobility of the upper trophic level receptor species used in the ERA, the use of maximum chemical concentrations (rather than mean concentrations) in the SERA to estimate the exposure via food webs is very conservative. This conservatism was reduced to more realistic levels in the values selected for use in the Step 3A refinement.

Comparisons to Background/Upgradient Concentrations -- Background or upgradient concentrations were used to judge the site-relatedness of individual chemicals in particular media. If site chemical concentrations were consistent with these levels, it was assumed that the concentrations were not site-related. However, it is possible that concentrations below background or reference are indeed site-related, rendering the assumption false. The impact of this possibility is minimal, though, since chemicals at concentrations consistent with background or reference conditions should exhibit no different ecological effects than commonly occurring in areas not affected by releases, regardless of their source.

Spatial Distribution of Samples -- The number and spatial distribution of the analytical samples were sufficient to adequately estimate potential ecological risks. Twenty-four soil samples were collected from SWMU 6, which is slightly more than 1 acre in size. In surface water and sediment from the lagoon system, 14 and 19 samples were collected, respectively, along approximately 1,400 feet of shoreline.

TABLE L-1
Chemicals of Potential Concern (COPCs) in Surface and Subsurface Soil Selected for Human Health Risk Assessment
SWMU 6, Former NASD, Vieques, Puerto Rico

Chemical	Units	Detection Frequency	Minimum [1] Concentration	Q	Maximum [2] Concentration	Q	Location of Maximum Concentration	Screening Toxicity Value	[3]	COPC Flag
Surface Soil										
BENZO(a)ANTHRACENE	MG/KG	5/23	0.04	J	1.87		W6-SB05	0.62	CA	YES
BENZO(a)PYRENE	MG/KG	7/23	0.04	J	1.51		W6-SB05	0.06	CA	YES
BENZO(b)FLUORANTHENE	MG/KG	8/23	0.03	J	1.80		W6-SB05	0.62	CA	YES
DIBENZ(a,h)ANTHRACENE	MG/KG	3/23	0.05	J	0.35	J	NDW06SS13	0.06	CA	YES
INDENO(1,2,3-c,d)PYRENE	MG/KG	6/23	0.05	J	1.13		NDW06SS13	0.62	CA	YES
ALUMINUM	MG/KG	23/23	3470.00		14000.00		W6-SB06	7614.20	NC	YES
ANTIMONY	MG/KG	19/23	0.17	J	13.30	J	W6-SB01	3.13	NC	YES
ARSENIC	MG/KG	23/23	0.48	J	7.90	J	NDW06SS23	0.39	NC	YES
CHROMIUM, TOTAL	MG/KG	23/23	3.07		42.90		W6-SB06	30.10	CA*	YES
IRON	MG/KG	23/23	2960.00		93200.00		NDW06SS23	2346.32	NC	YES
LEAD	MG/KG	23/23	3.58	J	617.00		W6-SB01	40.00	NC	YES
MANGANESE	MG/KG	23/23	30.90		741.00		NDW06SS23	176.24	NC	YES
THALLIUM	MG/KG	3/23	0.77	J	4.30		W6-SB01	0.52	NC	YES
VANADIUM	MG/KG	23/23	9.84	J	71.40		NDW06SS21	54.75	NC	YES
Subsurface Soil										
Arsenic	MG/KG	8/8	0.88	J	2.20	J	W6-SB01	1.59	CA	YES

Note:
1) Minimum/Maximum detected concentrations.
2) Maximum concentration is used for screening.
3) EPA Region 9 PRGs Table, October 1, 2002, U.S. EPA Region 9.
PRG value for pyrene used as surrogate for benzo(g,h,i)perylene and phenanthrene.
PRG value for chromium VI used for total chromium.
Q = Qualifier flag
J = Estimated Value
CA = Carcinogenic
NC = Noncarcinogenic
CA* (where: NC < 100X CA)
HHRA = human health risk assessment

TABLE L-2
Chemicals of Potential Concern (COPCs) in Groundwater for Human Health Risk Assessment
SWMU 6, Former NASD, Vieques, Puerto Rico

Chemical	Units	Minimum [1] Concentration	Qualifier	Maximum [1] Concentration	Qualifier	Location of Maximum Concentration	Detection Frequency	Concentration Used for Screening	Screening Toxicity Value	[4]	Potential ARAR/TBC Value	Potential ARAR/TBC Source	COPC Flag
CHLOROFORM	µg/L	1.1		1.1		NDW06MW01	1/10	1.1	0.6	CA/NC	NA	NA	YES
PCB-1221 (AROCHLOR 1221)	µg/L	0.7		0.7		SWMU6-MW04	1/11	0.7	0.03	CA	5.0	MCL	YES
PCB-1232 (AROCHLOR 1232)	µg/L	0.1	J	0.1	J	SWMU6-MW04	1/11	0.1	0.03	CA	5.0	MCL	YES
ANTIMONY	µg/L	3.7	J	104.0	J	NDW06MW03	4/10	104.0	1.5	NC	6.0	MCL	YES
ARSENIC	µg/L	3.5	J	152.0	J	NDW06MW05	7/10	152.0	0.04	CA	10.0	MCL	YES
BARIUM	µg/L	122.0	J	728.0	J	NDW06MW02	10/10	728.0	255.5	NC	2000.0	MCL	YES
CADMIUM	µg/L	2.0	J	14.2	J	NDW06MW05	5/10	14.2	1.8	NC	5.0	MCL	YES
CHROMIUM, TOTAL	µg/L	2.7	J	58.8	J	NDW06MW05	7/10	58.8	10.9	NC	100.0	MCL	YES
IRON	µg/L	43.0	J	6090.0	J	NDW06MW03	7/10	6090.0	1095.0	NC	300.0	NSDWS	YES
MANGANESE	µg/L	339.0		14300.0		SWMU6-MW01	10/10	14300.0	87.6	NC	50.0	NSDWS	YES
SELENIUM	µg/L	2.9	J	133.0		NDW06MW02	9/10	133.0	18.2	NC	50.0	MCL	YES
SILVER	µg/L	6.7	J	56.4	J	NDW06MW05	3/10	56.4	18.2	NC	100.0	NSDWS	YES
THALLIUM	µg/L	56.5	J	60.4	J	NDW06MW05	2/10	60.4	0.2	NC	2.0	MCL	YES
ANTIMONY, DISSOLVED	µg/L	1.8	J	1.8	J	SWMU6-MW03	1/10	1.8	1.5	NC	6.0	MCL	YES
ARSENIC, DISSOLVED	µg/L	4.8	J	25.2	J	NDW06MW02	7/10	25.2	0.0	CA	10.0	MCL	YES
BARIUM, DISSOLVED	µg/L	135.0	J	780.0	J	NDW06MW02	10/10	780.0	255.5	NC	2000.0	MCL	YES
CADMIUM, DISSOLVED	µg/L	1.8	J	2.9	J	SWMU6-MW01	4/10	2.9	1.8	NC	5.0	MCL	YES
CHROMIUM, DISSOLVED	µg/L	4.5	J	19.8	J	NDW06MW04	6/10	19.8	10.9	NC	100.0	MCL	YES
IRON, DISSOLVED	µg/L	12.7	J	5230.0	J	NDW06MW03	4/7	5230.0	1095.0	NC	300.0	NSDWS	YES
MANGANESE, DISSOLVED	µg/L	315.0	J	11800.0		SWMU6-MW01	10/10	11800.0	87.6	NC	50.0	NSDWS	YES
SELENIUM, DISSOLVED	µg/L	5.0	J	258.0	J	NDW06MW03	7/10	258.0	18.2	NC	50.0	MCL	YES

[1] Minimum/Maximum detected concentrations.
[2] Maximum concentration is used for screening.
[3] Background values not available.
[4] EPA Region 9 PRGs Table, October 1, 2002, U.S. EPA Region 9.
PRG value for 2-methylnaphthalene calculated using provisional reference dose and methods described in Region 9 PRGs Table Users Guide/Technical Background Document, October 1, 2002, U.S. EPA Region 9.
PRG value for chromium VI used for total chromium.
PRG value for mercury chloride used as surrogate for mercury.
Lead action level is 15 µg/L.
[5] Rationale Codes:
Above Screening Levels (ASL)
No Toxicity Information (NTX)
Essential Nutrient (NUT)
Below Screening Level (BSL)

MCL = Maximum Contaminant Level from EPA's National Primary Drinking Water Standards
The highest level of a contaminant that is allowed in drinking water. MCLs are set as close to MCLGs as feasible using the best available treatment technology and taking cost into consideration. MCLs are enforceable standards.
NSDWS = National Secondary Drinking Water Standards are non-enforceable guidelines regulating contaminants that may cause cosmetic effects (such as skin or tooth discoloration) or aesthetic effects (such as taste, odor, or color) in drinking water.
AL = Action Level
COPC = Chemical of Potential Concern
ARAR/TBC = Applicable or Relevant and Appropriate Requirement/To Be Considered
J = Estimated Value
CA = Carcinogenic
NC = Noncarcinogenic

TABLE L-3
Chemicals of Potential Concern (COPCs) in Sediment for Human Health Risk Assessment
SWMU 6, Former NASD, Vieques, Puerto Rico

Chemical	Units	Minimum [1] Concentration	Q	Maximum [2] Concentration	Q	Location of Maximum Concentration	Detection Frequency	Screening [3] Toxicity Value		COPC Flag
BENZO(a)PYRENE	MG/KG	0.1	J	0.1	J	NDW06SD12	1/19	0.06	CA	YES
ALUMINUM	MG/KG	1810.0		19300.0		W6-SD03	19/19	7614	NC	YES
ANTIMONY	MG/KG	0.3	J	97.8	J	W6-SD02	15/19	3.1	NC	YES
ARSENIC	MG/KG	1.1	J	555.0		W6-SD02	19/19	0.4	CA*	YES
BARIUM	MG/KG	4.5	J	571.0		W6-SD02	19/19	537.5	NC	YES
CADMIUM	MG/KG	0.0	J	13.7		W6-SD02	12/19	3.7	NC	YES
CHROMIUM, TOTAL	MG/KG	2.0	J	67.8		W6-SD02	19/19	30.1	CA**	YES
IRON	MG/KG	2640.0		25700.0		W6-SD03	19/19	2346.3	NC	YES
MANGANESE	MG/KG	30.2		388.0	J	NDW06SD08	19/19	176.2	NC	YES
SELENIUM	MG/KG	0.3	J	544.0		W6-SD02	14/19	39.1	NC	YES
THALLIUM	MG/KG	0.6	J	572.0		W6-SD02	5/19	0.5	NC	YES
VANADIUM	MG/KG	6.5	J	174.0		W6-SD02	19/19	54.7	NC	YES

Note:
1) Minimum/Maximum detected concentrations.
2) Maximum concentration is used for screening.
3) EPA Region 9 PRGs Table, October 1, 2002, U.S. EPA Region 9.
PRG value for chromium VI used for total chromium.
COPC = Chemical of Potential Concern
Q = Qualifier flag
J = Estimated Value
CA = Carcinogenic
NC = Noncarcinogenic
CA* (where: NC > 100X CA)
HHRA = human health risk assessment

TABLE L-4
Chemicals of Potential Concern (COPCs) for Surface Water - HHRA
SWMU 6, Former NASD, Vieques, Puerto Rico

Chemical	Units	Minimum [1] Concentration Qualifier		Maximum [1] Concentration Qualifier		Location of Maximum Concentration	Detection Frequency	Concentration [2] Used for Screening	Screening [4] Toxicity Value		COPC Flag
ARSENIC	µg/L	3.8	J	5.3	J	W6-SW06	3/14	5.3	0.0	CA	YES
IRON	µg/L	614	J	1410	J	W6-SW07	7/14	1410	1095	NC	YES
MERCURY	µg/L	0.02	J	1.6	J	W6-SW03	7/8	1.6	1.1	NC	YES
THALLIUM	µg/L	4.9	J	4.9	J	W6-SW02	1/14	4.9	0.2	NC	YES

Note:
1) Minimum/Maximum detected concentrations.
2) Maximum concentration is used for screening.
3) EPA Region 9 PRGs Table, October 1, 2002, U.S. EPA Region 9. (HI=0.1 for non-carcs.)
COPC = Chemical of Potential Concern
Q = Qualifier flag
J = Estimated Value
CA = Carcinogenic
NC = Noncarcinogenic

TABLE L-5
Potentially Complete Exposure Pathways and Receptors in Risk Assessment
SWMU 6, Former NASD, Vieques, Puerto Rico

Future/Current Receptor	Media	Exposure Route and Point of Exposure	Pathway Selected for Evaluation	Reason for Selection or Exclusion
Maintenance Worker	Surface Soil	Ingestion, dermal contact, and inhalation exposure to COPCs in site surface soils	Yes	Scenario is protective of an occasional maintenance work.
Industrial Worker	Surface Soil	Ingestion, dermal contact, and inhalation exposure to COPCs in site surface soils	Yes	Area could be developed in the future for industrial use. Both site soil and groundwater exposure is assumed.
	Groundwater	Ingestion, dermal contact exposure to COPCs in groundwater	Yes	Groundwater is not suitable for potable/industrial use; however, for conservative risk estimation, this medium was included
Construction Worker	Subsurface Soil	Ingestion, dermal contact and inhalation exposure to COPCs in site subsurface soils	Yes	Scenario is protective of an occasional construction activities at the site.

TABLE L-5
Potentially Complete Exposure Pathways and Receptors in Risk Assessment
SWMU 6, Former NASD, Vieques, Puerto Rico

Future/Current Receptor	Media	Exposure Route and Point of Exposure	Pathway Selected for Evaluation	Reason for Selection or Exclusion
Maintenance Worker	Surface Soil	Ingestion, dermal contact, and inhalation exposure to COPCs in site surface soils	Yes	Scenario is protective of an occasional maintenance work.
Industrial Worker	Surface Soil	Ingestion, dermal contact, and inhalation exposure to COPCs in site surface soils	Yes	Area could be developed in the future for industrial use. Both site soil and groundwater exposure is assumed.
	Groundwater	Ingestion, dermal contact exposure to COPCs in groundwater	No	Groundwater exposure is likely through dermal pathway, and contribution by this pathway is negligible therefore not included for quantitative estimation
Recreational Users (adult, youth and child)	Surface Soil	Ingestion, dermal contact, and inhalation exposure to COPCs in site surface soils	Yes	Area could be developed in the future for recreational use and would be protective of an occasional trespasser.
	Surface Water	Ingestion, dermal contact, and inhalation exposure to COPCs in site surface water	Yes	Area could be developed in the future for recreational use and would be protective of any occasional trespasser.
	Sediment	Ingestion, and dermal contact, exposure to COPCs in sediments	Yes	Area could be developed in the future for recreational use and would be protective of any occasional trespasser.
Residents (adult and child)	Surface Soil	Ingestion, dermal contact, and inhalation exposure to COPCs in site surface soils	Yes	Although the site is unlikely to be considered for residential development, this is a worst-case scenario for comparison purposes.
	Subsurface Soil	Ingestion, dermal contact, and inhalation exposure to COPCs in site subsurface soils	Yes	Although the site is unlikely to be considered for residential development, this is a worst-case scenario for comparison purposes.
	Groundwater	Ingestion and dermal contact exposure to COPCs in site surface soils	Yes	Although the site is unlikely to be considered for residential development, and groundwater is not suitable for potable use, this is a worst-case scenario for comparison purposes.

TABLE L-6
Exposure Point Concentration (EPCs) for Surface and Subsurface Soil - HHRA
SWMU 6, Former NASD, Vieques, Puerto Rico

Chemical of Potential Concern	Units	Arithmetic Mean	UCL (Distribution)		Maximum Concentration (Qualifier)		Exposure Point Concentration	
							Value	Statistic
Surface Soil								
BENZO(a)ANTHRACENE	MG/KG	0.31	0.63	(NP)	1.87		0.63	95% Cheb-m
BENZO(a)PYRENE	MG/KG	0.31	0.59	(NP)	1.51		0.59	95% Cheb-m
BENZO(b)FLUORANTHENE	MG/KG	0.30	0.62	(NP)	1.80		0.62	95% Cheb-m
DIBENZ(a,h)ANTHRACENE	MG/KG	0.26	0.31	(NP)	0.35	J	0.31	95% Cheb-m
INDENO(1,2,3-c,d)PYRENE	MG/KG	0.29	0.48	(NP)	1.13		0.48	95% Cheb-m
ALUMINUM	MG/KG	7097	8525	(T)	14000		8525	95% UCL-T
ANTIMONY	MG/KG	1.22	2.26	(T)	13.30	J	2.26	95% UCL-T
ARSENIC	MG/KG	1.71	3.51	(NP)	7.90	J	3.51	95% Cheb-m
CHROMIUM, TOTAL	MG/KG	13.14	18.56	(T)	42.90		18.56	95% UCL-T
IRON	MG/KG	18515.7	27981.7	(T)	93200.0		27981.7	95% UCL-T
LEAD	MG/KG	78.5	281.5	(NP)	617.0		281.5	97.5% Cheb-m
MANGANESE	MG/KG	198.2	343.7	(T)	741.0		343.7	95% UCL-T
THALLIUM	MG/KG	0.35	1.15	(NP)	4.30		1.15	95% Cheb-m
VANADIUM	MG/KG	28.18	45.3	(NP)	71.4		45.3	95% Cheb-m
Subsurface Soil								
ARSENIC	MG/KG	1.28	1.75	(T)	2.20	J	1.75	95% UCL-T

Note:
Full statistics for data included in Appendix X.
For non-detects, 1/2 sample quantitation limit was used as a proxy concentration
ProUCL, Version 2.1 used to determine distribution of data and to calculate RME EPC
(USEPA. February 2003. ProUCL, Version 2.1. Prepared by Lockheed Martin Environmental Services).

Statistics:
Maximum Detected Value (Max); 95% UCL of Normal Data (95% UCL-N); 95% UCL of Log-transformed Data, H-Statistic (95% UCL-T)
95% Chebyshev (mean,std) UCL (95% Cheb-m); 97.5% Chebyshev (mean,std) UCL (97.5% Cheb-m);
Max = RME calculatedexceeded the max, therefore max is used as EPC
N = Normal
J = Estimated Value
T = Log-Transformed
NP = Non-Parametric

TABLE L-7
Exposure Point Concentration (EPCs) for Groundwater – HHRA
SWMU 6, Former NASD, Vieques, Puerto Rico

Chemical of Potential Concern	Units	Arithmetic Mean	UCL (Distribution)		Maximum Concentration (Qualifier)		Exposure Point Concentration	
							Value	Statistic
CHLOROFORM	µG/L	0.42	0.76	(NP)	1.10		0.76	95% Cheb-m
PCB-1221 (AROCHLOR 1221)	µG/L	0.23	0.50	(NP)	0.70		0.50	95% Cheb-m
PCB-1232 (AROCHLOR 1232)	µG/L	0.20	0.36	(NP)	0.09	J	0.09	Max
Perchlorate	µG/L	14.28	21.17	(NP)	12.80	J	12.80	Max
ANTIMONY	µG/L	30.4	346.1	(T)	104.0	J	104.0	Max
ARSENIC	µG/L	31.7	76.8	(T)	152.0	J	76.8	95% Cheb
BARIUM	µG/L	289.7	475.7	(T)	728.0	J	475.7	95% UCL-T
CADMIUM	µG/L	3.8	9.0	(NP)	14.2	J	9.0	95% Cheb-m
CHROMIUM, TOTAL	µG/L	12.47	33.33	(T)	58.80	J	33.33	95% UCL-T
IRON	µG/L	1209.6	7825.9	(T)	6090.0	J	6090.0	Max
MANGANESE	µG/L	3552.6	8815.0	(T)	14300.0		8815.0	95% Cheb
SELENIUM	µG/L	57.7	221.0	(T)	133.0		133.0	Max
SILVER	µG/L	9.0	71.1	(T)	56.4	J	56.4	Max
THALLIUM	µG/L	19.2	64.1	(NP)	60.4	J	60.4	Max

Note:
Full statistics for data included in Appendix X.
For non-detects, 1/2 sample quantitation limit was used as a proxy concentration
ProUCL, Version 2.1 used to determine distribution of data and to calculate RME EPC
(USEPA. February 2003. ProUCL, Version 2.1. Prepared by Lockheed Martin Environmental Services).
Statistics:
Maximum Detected Value (Max); 95% UCL of Log-transformed Data, H-Statistic (95% UCL-T);
95% Chebyshev (mean, std) UCL (95% Cheb-m);
Max - 95% UCL exceeds maximum detected concentration. Therefore, maximum concentration used for EPC.
J = Estimated Value
T = Log-Transformed
NP = Non-Parametric

TABLE L-8
Exposure Point Concentration (EPCs) for Sediment - HHRA
SWMU 6, Former NASD, Vieques, Puerto Rico

Chemical of Potential Concern	Units	Arithmetic Mean	UCL (Distribution)		Maximum Concentration (Qualifier)		Exposure Point Concentration	
							Value	Statistic
BENZO(a)PYRENE	MG/KG	0.46	0.66	(T)	0.08	J	0.08	Max
ALUMINUM	MG/KG	8765.26	12916.55	(T)	19300.00		12916.55	95% UCL-T
ANTIMONY	MG/KG	5.67	37.63	(NP)	97.80	J	37.63	97.5% Cheb-m
ARSENIC	MG/KG	33.24	214.32	(NP)	555.00		214.32	97.5% Cheb-m
BARIUM	MG/KG	38.95	223.61	(NP)	571.00		223.61	97.5% Cheb-m
CADMIUM	MG/KG	0.81	5.29	(NP)	13.70		5.29	97.5% Cheb-m
CHROMIUM, TOTAL	MG/KG	13.78	22.40	(T)	67.80		22.40	95% UCL-T
IRON	MG/KG	14188.42	21650.16	(NP)	25700.00		21650.16	95% UCL-T
MANGANESE	MG/KG	168.27	270.90	(T)	388.00	J	270.90	95% UCL-T
SELENIUM	MG/KG	29.36	207.91	(NP)	544.00		207.91	97.5% Cheb-m
THALLIUM	MG/KG	30.46	329.81	(NP)	572.00		329.81	99% Cheb-m
VANADIUM	MG/KG	35.48	54.30	(T)	174.00		54.30	95% UCL-T

Note:
Full statistics for data included in Appendix X.
For non-detects, 1/2 sample quantitation limit was used as a proxy concentration
ProUCL, Version 2.1 used to determine distribution of data and to calculate RME EPC
(USEPA. February 2003. ProUCL, Version 2.1. Prepared by Lockheed Martin Environmental Services).
Statistics:
Maximum Detected Value (Max); 95% UCL of Log-transformed Data, H-Statistic (95% UCL-T);
95% Chebyshev (mean, std) UCL (95% Cheb-m);
Max - 95% UCL exceeds maximum detected concentration. Therefore, maximum concentration used for EPC.
J = Estimated Value
T = Log-Transformed

TABLE L-9
Exposure Point Concentration (EPCs) for Surface Water - HHRA
SWMU 6, Former NASD, Vieques, Puerto Rico

Chemical of Potential Concern	Units	Arithmetic Mean	UCL (Distribution)		Maximum Concentration (Qualifier)		Exposure Point Concentration	
							Value	Statistic
ARSENIC	µG/L	11.7	26.9	(NP)	5.3	J	5.3	Max
IRON	µG/L	528.8	1012.3	(NP)	1410.0	J	1012.3	95% Cheb-m
MERCURY	µG/L	0.2	1.5	(NP)	1.6	J	1.5	95% Cheb-m
THALLIUM	µG/L	13.6	34.1	(NP)	4.9	J	4.9	Max

Note:
Full statistics for data included in Appendix X.
For non-detects, 1/2 sample quantitation limit was used as a proxy concentration
ProUCL, Version 2.1 used to determine distribution of data and to calculate RME EPC
(USEPA. February 2003. ProUCL, Version 2.1. Prepared by Lockheed Martin Environmental Services).
Statistics:
Maximum Detected Value (Max); 95% Chebyshev (mean, std) UCL (95% Cheb-m)
Max = RME calculated exceeded the max, therefore max is used as EPC
J = Estimated Value
NP = Non-Parametric

TABLE L-10
Risk Results Summary
SWMU 6, Former NASD, Vieques, Puerto Rico

Receptor	Exposure Medium	Cancer Risk	Hazard Index	Max HI/target organ	
Maintenance worker	surface soil	1.5E-06	0.069	NA	
Industrial worker	surface soil	7.3E-06	0.33	NA	
	groundwater*	4.1E-04	21.8	7.7	kidney
Construction worker	subsurface soil	6.6E-08	0.02	NA	
Recreational -Adult	surface soil	3.7E-06	0.18	NA	
	sediment	2.4E-05	0.89	NA	kidney
	surface water	4.4E-07	0.016	NA	
Recreational - Youth	surface soil	2.3E-06	0.27	NA	
	sediment	1.4E-05	1.2	1.1	kidney
	surface water	2.4E-07	0.02	NA	
Recreational - Child	surface soil	5.4E-06	0.95	NA	
	sediment	3.2E-05	5.5	4.8	kidney
	surface water	4.5E-07	0.061	NA	
Residential -Adult	Surface and subsurface soil	9.8E-06	0.39	NA	
	Groundwater*	1.1E-03	62	21	kidney
Residential - Child	surface and subsurface soil	2.2E-05	3.3	NA	Kidney, blood, GI
	groundwater*	6.4E-04	142	53	Kidney
COPCs Contributing to risk >1E-06, or HI>1.0		Arsenic in groundwater	Iron and vanadium in soil, and thallium in sediment and thallium, manganese, perchlorate, antimony, arsenic in groundwater.		

Note:

Perchlorate was detected only once in groundwater in one well during 2003 sampling, non-detect in 2004 sampling

* - groundwater has high salinity and non-potable

TABLE L-11
Comparison of Surface and Subsurface Soil Inorganic COPCs[4] with Background Levels
SWMU 6, Former NASD, Vieques, Puerto Rico

							Background Concentration		
Chemical	**Number Analyzed**	**Number Detected**	**Minimum Detect (mg/Kg)**	**Maximum Detect (mg/Kg)**	**Mean Concentration[1] (mg/Kg)**	**Screening PRG [2]**	**UTL95% Concentration[3] (mg/Kg)**	**Minimum (mg/kg)**	**Maximum (mg/kg)**
Surface Soil									
IRON	23	23	2960	93200	18500	2346.32	37531	2500	39,000
LEAD	23	23	3.58	617	78.5	40	6.9	0.3	6.9
VANADIUM	23	23	9.84	71.4	28.2	54.75	130	9.0	130

[1] Mean concentration is based on 1/2 the detection limit for non-detects.

[2] EPA Region 9 residential PRG for surface soil and industrial PRG for subsurface soil.

[3] for soils -Final Soil, Groundwater, Surface Water, and Sediment Background Investigation Report (CH2M HILL, 2002).

[4]Includes only chemicals presenting hazards above target value of 1.0.

TABLE L-12
Comparison of Groundwater Inorganic COPCs with Background Levels
SWMU 6, Former NASD, Vieques, Puerto Rico

Chemical	Number Analyzed	Number Detected	Minimum Detect (µg/L)	Maximum Detect (µg/L)	Mean Concentration[1] (µg/L)	Tap Water PRG[2]	Background Concentrations	
							Site-Specific [3] (µg/L)	Base-Wide [4] (µg/L)
Total Inogranic Chemicals								
ANTIMONY	10	4	3.7	104	30.8	1.46	ND	5.2
ARSENIC	10	7	3.5	152	41.1	0.04	ND	ND
CADMIUM	10	6	2	14.2	4.08	1.82	ND	1
IRON	10	7	43	6090	1200	1090	ND	4800
MANGANESE	10	10	339	14300	3590	87.60	616	616
THALLIUM	10	2	56.5	60.4	17.3	0.24	ND	ND
SELENIUM	10	9	2.9	191	69.1	18.2	76.7	2.3
Dissolved Inorganic Chemicals								
ANTIMONY, DISSOLVED	10	1	1.8	1.8	9.76	1.46	ND	9
ARSENIC, DISSOLVED	10	7	4.8	25.2	16.8	0.04	ND	5.5
CADMIUM, DISSOLVED	10	4	1.8	2.9	2.2	1.82	ND	1
IRON, DISSOLVED	7	4	12.7	5230	1180	1090	ND	490
MANGANESE, DISSOLVED	10	10	315	11800	2980	87.60	593	18000
THALLIUM, DISSOLVED	10	0	ND	ND	ND	ND	ND	16
SELENIUM, DISSOLVED	10	6	5	258	95.4	18.2	98.6	ND

[1] Mean concentration is based on 1/2 the detection limit for non-detects.

[2] PRG

[3] Site-specific background sample from one well NDAJGW08. This well indicated a freshwater (low TDS), while site wells were saline water with high TDS.

[4] Base-wide

TABLE L-13
Comparison of Sediment Inorganic COPCs with Background Levels
SWMU 6, Former NASD, Vieques, Puerto Rico

Chemical	Number Analyzed	Number Detected	Maximum Detect (mg/Kg)	Minimum Detect (mg/Kg)	Mean Concentration [1] (mg/Kg)	Background Concentrations	
						Site-Specific [2] (mg/Kg)	Base-Wide [3] (mg/Kg)
THALLIUM	19	5	572.0	0.586	30	0.284	1.8

[1] Mean concentration is based on 1/2 the detection limit for non-detects.

[2] Site-specific background sediment samples NDA06SD10 and NDA06SD11.

3 Basewide sediment values are from previous background study (CH2M HILL, 2002)

TABLE L-14
Plant Species Observed at SWMU 6
SWMU 6, Former NASD, Vieques, Puerto Rico

Common Name	Scientific Name	Stratum
Aroma, sweet acacia	*Acacia farnesiana*	S
Black mangrove	*Avicennia germinans*	S
Bay flower	*Blutaparon vermiculare*	H
None	*Croton discolor*	S
Purple allamanda	*Cryptostegia grandiflora*	S
Salt heliotrope	*Heliotropium curassavicum*	H
None	*Jacquinia arborea*	S
None	*Jasminum fluminense*	V
Belly ache bush, body catta	*Jatropha gossypifolia*	S
White mangrove	*Laguncularia racemosa*	S
Sage, cariaquillo	*Lantana* sp.	S
None	*Mikania cordifolia*	V
Mesquite	*Prosopis glandulosa*	S
Tintillo, Christmas tree	*Randia aculeata*	S
Red mangrove	*Rhizophora mangle*	S
Sea purslane, sea pusley, bay flower	*Sesuvium portulacastrum*	H
Seashore dropseed	*Sporobolus virginicus*	H
None	*Stigmaphyllon periplocifolium*	V
White cedar, pink cedar	*Tabebuia heterophylla*	T
Emajaguilla, portiatree	*Thespesia populnea*	T

S = shrub
T = tree
H = herbaceous
V = vine

TABLE L-15
Wildlife Observed at SWMU 6
SWMU 6, Former NASD, Vieques, Puerto Rico

English Name	Scientific Name
Invertebrates	
Land crab	*Geocarina lateralis*
Fiddler crab	*Uca spp.*
Reptiles	
Lizards	*Anolis* sp.
Birds	
Green Heron	*Butorides virescens*
Bananaquit	*Coereba flaveola*
White-crowned Dove	*Columba leucocephala*
Yellow Warbler	*Dendroica petechia*
Common Moorhen	*Gallinula chloropus*
Pearly-eyed Thrasher	Margarops fuscatus
Zenaida Dove	*Zenaida aurita*

TABLE L-16
Federally Listed Species Occurring or Potentially Occurring at NASD Vieques
SWMU 6, Former NASD, Vieques, Puerto Rico

Scientific Name (Common Name)	Federal Status
Plants	
Chaemacrista glandulosa var. mirabilis (Herb)	Endangered
Stahlia monosperma (Cobana negra)	Threatened
Calyptranthes thomasiana (Tree)	Endangered
Eugenia woodburyana (Evergreen tree)	Endangered
Goetzea elegans (Beautiful goetzea)	Endangered
Reptiles and Amphibians	
Chelonia mydas (Green sea turtle)	Threatened
Dermochelys coriacea (Leatherback sea turtle)	Endangered
Caretta caretta (Loggerhead sea turtle)	
Eretmochelys imbricata (Hawksbill sea turtle)	Endangered
Birds	
Falco peregrinus tundrius (Arctic peregrine falcon)	Threatened
Pelecanus occidentalis occidentalis (Brown pelican)	Endangered
Sterna dougalli dougalli (Roseate tern)	Endangered
Mammals	
Physeter macrocephalus (Sperm whale)	Endangered
Balaenoptera physalus (Fin whale)	Endangered
Megaptera novaeangliae (Humpback whale)	Endangered
Trichechus manatus (West Indian manatee)	Endangered

Source: Geo-Marine Inc. 2000

TABLE L-17
Plant Species Observed at SWMU 6
SWMU 6, Former NASD, Vieques, Puerto Rico

Common Name	Scientific Name	Stratum
Aroma, sweet acacia	*Acacia farnesiana*	S
Black mangrove	*Avicennia germinans*	S
Bay flower	*Blutaparon vermiculare*	H
None	*Croton discolor*	S
Purple allamanda	*Cryptostegia grandiflora*	S
Salt heliotrope	*Heliotropium curassavicum*	H
None	*Jacquinia arborea*	S
None	*Jasminum fluminense*	V
Belly ache bush, body catta	*Jatropha gossypifolia*	S
White mangrove	*Laguncularia racemosa*	S
Sage, cariaquillo	*Lantana* sp.	S
None	*Mikania cordifolia*	V
Mesquite	*Prosopis glandulosa*	S
Tintillo, Christmas tree	*Randia aculeata*	S
Red mangrove	*Rhizophora mangle*	S
Sea purslane, sea pusley, bay flower	*Sesuvium portulacastrum*	H
Seashore dropseed	*Sporobolus virginicus*	H
None	*Stigmaphyllon periplocifolium*	V
White cedar, pink cedar	*Tabebuia heterophylla*	T
Emajaguilla, portiatree	*Thespesia populnea*	T

S = shrub
T = tree
H = herbaceous
V = vine

TABLE L-18
Wildlife Observed at SWMU 6
SWMU 6, Former NASD, Vieques, Puerto Rico

English Name	Scientific Name
Invertebrates	
Land crab	*Geocarina lateralis*
Fiddler crab	*Uca spp.*
Reptiles	
Lizards	*Anolis* sp.
Birds	
Green Heron	*Butorides virescens*
Bananaquit	*Coereba flaveola*
White-crowned Dove	*Columba leucocephala*
Yellow Warbler	*Dendroica petechia*
Common Moorhen	*Gallinula chloropus*
Pearly-eyed Thrasher	Margarops fuscatus
Zenaida Dove	*Zenaida aurita*

TABLE L-19
Federally Listed Species Occurring or Potentially Occurring at NASD Vieques
SWMU 6, Former NASD, Vieques, Puerto Rico

Scientific Name (Common Name)	Federal Status
Plants	
Chaemacrista glandulosa var. mirabilis (Herb)	Endangered
Stahlia monosperma (Cobana negra)	Threatened
Calyptranthes thomasiana (Tree)	Endangered
Eugenia woodburyana (Evergreen tree)	Endangered
Goetzea elegans (Beautiful goetzea)	Endangered
Reptiles and Amphibians	
Chelonia mydas (Green sea turtle)	Threatened
Dermochelys coriacea (Leatherback sea turtle)	Endangered
Caretta caretta (Loggerhead sea turtle)	
Eretmochelys imbricata (Hawksbill sea turtle)	Endangered
Birds	
Falco peregrinus tundrius (Arctic peregrine falcon)	Threatened
Pelecanus occidentalis occidentalis (Brown pelican)	Endangered
Sterna dougalli dougalli (Roseate tern)	Endangered
Mammals	
Physeter macrocephalus (Sperm whale)	Endangered
Balaenoptera physalus (Fin whale)	Endangered
Megaptera novaeangliae (Humpback whale)	Endangered
Trichechus manatus (West Indian manatee)	Endangered

Source: Geo-Marine Inc. 2000

TABLE L-20
Preliminary Assessment Endpoints, Risk Hypotheses, and Measurement Endpoints
SWMU 6 Former NASD, Vieques Island, Puerto Rico

Assessment Endpoint	Risk Hypothesis	Measurement Endpoint	Receptor
Terrestrial Habitats			
Survival, growth, and reproduction of terrestrial soil invertebrate communities	Are site-related chemical concentrations in surface soil sufficient to adversely effect soil invertebrate communities?	Comparison of maximum chemical concentrations in surface soil with soil screening values.	Soil invertebrates
Survival, growth, and reproduction of terrestrial plant communities	Are site-related chemical concentrations in surface soil sufficient to adversely effect terrestrial plant communities?	Comparison of maximum chemical concentrations in surface soil with soil screening values.	Terrestrial plants
Survival, growth, and reproduction of terrestrial reptile populations	Are site-related chemical concentrations in surface soil sufficient to cause adverse effects (on growth, survival, or reproduction) to terrestrial reptile populations?	Evidence of potential risk to other upper trophic level terrestrial receptors evaluated in the ERA.	--
Survival, growth, and reproduction of avian terrestrial omnivore populations	Are site-related chemical concentrations in surface soil sufficient to cause adverse effects (on growth, survival, or reproduction) to avian receptor populations that may consume terrestrial plants and soil invertebrates from the site?	Comparison of literature-derived chronic No Observed Adverse Effect Level (NOAEL) values for survival, growth, and/or reproductive effects with modeled dietary exposure doses based on maximum surface soil concentrations.	Pearly-eyed thrasher
Survival, growth, and reproduction of avian terrestrial carnivore populations	Are site-related chemical concentrations in surface soil sufficient to cause adverse effects (on growth, survival, or reproduction) to avian receptor populations that may consume small mammals from the site?	Comparison of literature-derived chronic No Observed Adverse Effect Level (NOAEL) values for survival, growth, and/or reproductive effects with modeled dietary exposure doses based on maximum surface soil concentrations.	Red-tailed hawk
Survival, growth, and reproduction of mammalian terrestrial omnivore populations	Are site-related chemical concentrations in surface soil sufficient to cause adverse effects (on growth, survival, or reproduction) to mammalian receptor populations that may consume terrestrial plants and soil invertebrates from the site?	Comparison of literature-derived chronic No Observed Adverse Effect Level (NOAEL) values for survival, growth, and/or reproductive effects with modeled dietary exposure doses based on maximum surface soil concentrations.	Norway rat
Survival, growth, and reproduction of mammalian terrestrial omnivore populations	Are site-related chemical concentrations in surface soil sufficient to cause adverse effects (on growth, survival, or reproduction) to mammalian receptor populations that may consume vegetation and small mammals from the site?	Comparison of literature-derived chronic No Observed Adverse Effect Level (NOAEL) values for survival, growth, and/or reproductive effects with modeled dietary exposure doses based on maximum surface soil concentrations.	Indian mongoose
Aquatic Habitats			
Survival, growth, and reproduction of benthic invertebrate communities	Are site-related chemical concentrations in sediment sufficient to adversely effect benthic invertebrate communities?	Comparison of maximum chemical concentrations in sediment with medium-specific screening values.	Benthic invertebrates
Survival, growth, and reproduction of fish communities	Are site-related chemical concentrations in sediment sufficient to adversely effect fish communities?	Comparison of maximum chemical concentrations in sediment with medium-specific screening values.	Fish

TABLE L-20
Preliminary Assessment Endpoints, Risk Hypotheses, and Measurement Endpoints
SWMU 6 Former NASD, Vieques Island, Puerto Rico

Assessment Endpoint	Risk Hypothesis	Measurement Endpoint	Receptor
Survival, growth, and reproduction of avian aquatic/wetland invertivore populations	Are site-related chemical concentrations in sediment sufficient to cause adverse effects (on growth, survival, or reproduction) to avian receptor populations that may consume primarily invertebrates from the site?	Comparison of literature-derived chronic No Observed Adverse Effect Level (NOAEL) values for survival, growth, and/or reproductive effects with modeled dietary exposure doses based on maximum sediment concentrations.	Spotted sandpiper
Survival, growth, and reproduction of avian aquatic/wetland piscivore populations	Are site-related chemical concentrations in sediment sufficient to cause adverse effects (on growth, survival, or reproduction) to avian receptor populations that may consume primarily fish from the site?	Comparison of literature-derived chronic No Observed Adverse Effect Level (NOAEL) values for survival, growth, and/or reproductive effects with modeled dietary exposure doses based on maximum sediment concentrations.	Green heron

TABLE L-21

Bioaccumulative Chemicals List and Log K_{ow} Values for Relevant Chemicals

SWMU 6 Former NASD, Vieques Island, Puerto Rico

Chemical	Log K_{ow} Range	Selected log K_{ow}	Reference
Inorganics			
Arsenic	-- - --	--	--
Cadmium	-- - --	--	--
Chromium	-- - --	--	--
Copper	-- - --	--	--
Lead	-- - --	--	--
Mercury	-- - --	--	--
Nickel	-- - --	--	--
Selenium	-- - --	--	--
Silver	-- - --	--	--
Zinc	-- - --	--	--
Pesticides/PCBs			
4,4'-DDD	5.90 - 6.65	6.10	USEPA 1995b
4,4'-DDE	5.63 - 6.96	6.76	USEPA 1995b
4,4'-DDT	5.56 - 7.01	6.53	USEPA 1995b
Aldrin	5.11 - 7.50	6.50	USEPA 1995b
alpha-BHC	3.75 - 3.81	3.80	USEPA 1995b
alpha-Chlordane	5.80 - 6.41	6.32	USEPA 1995b
Aroclor-1016	-- - --	5.60	Sample et al. 1996
Aroclor-1221	-- - --	4.70	Jones et al. 1997
Aroclor-1232	-- - --	5.10	Jones et al. 1997
Aroclor-1242	-- - --	5.60	Jones et al. 1997
Aroclor-1248	-- - --	6.20	Jones et al. 1997
Aroclor-1254	-- - --	6.50	Jones et al. 1997
Aroclor-1260	-- - --	6.80	Jones et al. 1997
beta-BHC	3.75 - 3.84	3.81	USEPA 1995b
delta-BHC	-- - --	4.10	USEPA 1996a
Dieldrin	3.63 - 6.20	5.37	USEPA 1995b
Endosulfan I	3.55 - 3.85	3.83	USEPA 1995b
Endosulfan II	3.62 - 4.52	4.52	USEPA 1995b
Endrin	2.92 - 5.20	5.06	USEPA 1995b
gamma-BHC (Lindane)	3.61 - 3.90	3.73	USEPA 1995b
gamma-Chlordane	5.80 - 6.41	6.32	USEPA 1995b
Heptachlor	4.93 - 6.26	6.26	USEPA 1995b
Heptachlor epoxide	3.50 - 5.40	5.00	USEPA 1995b
Methoxychlor	4.20 - 5.60	5.08	USEPA 1995b

TABLE L-21

Bioaccumulative Chemicals List and Log K_{ow} Values for Relevant Chemicals

SWMU 6 Former NASD, Vieques Island, Puerto Rico

Chemical	Log K_{ow} Range	Selected log K_{ow}	Reference
Toxaphene	4.33 - 5.56	5.50	USEPA 1995b
Volatile and Semivolatile Organics			
1,1,2,2-Tetrachloroethane	2.31 - 2.64	2.39	USEPA 1995b
1,2,4-Trichlorobenzene	3.89 - 4.23	4.01	USEPA 1995b
1,2-Dichlorobenzene	3.20 - 3.61	3.43	USEPA 1995b
1,3-Dichlorobenzene	-- - --	3.50	USEPA 1996a
1,4-Dichlorobenzene	3.26 - 3.62	3.42	USEPA 1995b
4-Bromophenyl-phenylether	4.89 - 5.24	5.00	USEPA 1995b
4-Chlorophenyl-phenylether	4.08 - 5.09	4.95	USEPA 1995b
Acenaphthene	3.77 - 4.49	3.92	USEPA 1995b
Acenaphthylene	-- - --	4.10	USEPA 1996a
Anthracene	4.44 - 4.80	4.55	USEPA 1995b
Benzo(a)anthracene	5.61 - 5.79	5.70	USEPA 1995b
Benzo(a)pyrene	5.98 - 6.34	6.11	USEPA 1995b
Benzo(b)fluoranthene	5.79 - 6.40	6.20	USEPA 1995b
Benzo(g,h,i)perylene	6.58 - 7.05	6.70	USEPA 1995b
Benzo(k)fluoranthene	6.12 - 6.27	6.20	USEPA 1995b
Chrysene	5.41 - 5.79	5.70	USEPA 1995b
Dibenz(a,h)anthracene	6.50 - 6.88	6.69	USEPA 1995b
Fluoranthene	4.84 - 5.39	5.12	USEPA 1995b
Fluorene	4.04 - 4.40	4.21	USEPA 1995b
Hexachlorobenzene	5.23 - 6.92	5.89	USEPA 1995b
Hexachlorobutadiene	4.74 - 5.16	4.81	USEPA 1995b
Hexachlorocyclopentadiene	5.05 - 5.51	5.39	USEPA 1995b
Hexachloroethane	3.82 - 4.14	4.00	USEPA 1995b
Indeno(1,2,3-cd)pyrene	6.58 - 6.72	6.65	USEPA 1995b
Pentachlorophenol	5.01 - 5.24	5.09	USEPA 1995b
Phenanthrene	4.37 - 4.57	4.55	USEPA 1995b
Pyrene	4.76 - 5.52	5.11	USEPA 1995b

TABLE L-22
Soil Bioconcentration and Bioaccumulation Factors For Plants, Soil Invertebrates, and Small Mammals - Step 2
SWMU 6 Former NASD, Vieques Island, Puerto Rico

Chemical	Soil-Plant BCF (dry weight)		Soil-Invertebrate BAF (dry weight)		Soil-Rat BAF (dry weight)	
	Value	Reference	Value	Reference	Value *	Reference
Inorganics						
Arsenic	1.103	Bechtel Jacobs 1998a	0.523	Sample et al. 1998a	0.014	Sample et al. 1998b
Cadmium	3.250	Bechtel Jacobs 1998a	40.69	Sample et al. 1998a	0.462	Sample et al. 1998b
Chromium	0.084	Bechtel Jacobs 1998a	3.162	Sample et al. 1998a	0.349	Sample et al. 1998b
Copper	0.625	Bechtel Jacobs 1998a	1.531	Sample et al. 1998a	0.554	Sample et al. 1998b
Lead	0.468	Bechtel Jacobs 1998a	1.522	Sample et al. 1998a	0.286	Sample et al. 1998b
Mercury	5.000	Bechtel Jacobs 1998a	20.63	Sample et al. 1998a	0.130	Sample et al. 1998b
Nickel	1.411	Bechtel Jacobs 1998a	4.730	Sample et al. 1998a	0.589	Sample et al. 1998b
Selenium	3.012	Bechtel Jacobs 1998a	1.340	Sample et al. 1998a	1.263	Sample et al. 1998b
Silver	0.037	Bechtel Jacobs 1998a	15.34	Sample et al. 1998a	0.810	Sample et al. 1998b
Zinc	1.820	Bechtel Jacobs 1998a	12.89	Sample et al. 1998a	2.782	Sample et al. 1998b
Pesticides/PCBs						
4,4'-DDD	0.0151	Travis and Arms 1988	2.00	Menzie et al. 1992	--	see text
4,4'-DDE	0.0216	Travis and Arms 1988	10.6	Menzie et al. 1992	--	see text
4,4'-DDT	0.0237	Travis and Arms 1988	0.70	Menzie et al. 1992	--	see text
Aldrin	0.0431	Travis and Arms 1988	3.30	Edwards and Bohlen 1992	--	see text
alpha-BHC	0.2633	Travis and Arms 1988	1.00	--	--	see text
alpha-Chlordane	0.0172	Travis and Arms 1988	4.00	Edwards and Bohlen 1992	--	see text
Aroclor-1016	0.0224	Travis and Arms 1988	15.9	Sample et al. 1998a	--	see text
Aroclor-1221	0.0744	Travis and Arms 1988	15.9	Sample et al. 1998a	--	see text
Aroclor-1232	0.0437	Travis and Arms 1988	15.9	Sample et al. 1998a	--	see text
Aroclor-1242	0.0224	Travis and Arms 1988	15.9	Sample et al. 1998a	--	see text
Aroclor-1248	0.0101	Travis and Arms 1988	15.9	Sample et al. 1998a	--	see text
Aroclor-1254	0.0068	Travis and Arms 1988	15.9	Sample et al. 1998a	--	see text
Aroclor-1260	0.0045	Travis and Arms 1988	15.9	Sample et al. 1998a	--	see text
beta-BHC	0.2633	Travis and Arms 1988	1.00	--	--	see text
delta-BHC	0.1653	Travis and Arms 1988	1.00	--	--	see text
Dieldrin	0.3089	Travis and Arms 1988	8.00	Beyer and Gish 1980	--	see text
Endosulfan I	0.3436	Travis and Arms 1988	1.00	--	--	see text
Endosulfan II	0.3131	Travis and Arms 1988	1.00	--	--	see text
Endrin	0.7948	Travis and Arms 1988	3.60	Edwards and Bohlen 1992	--	see text
gamma-BHC (Lindane)	0.3173	Travis and Arms 1988	1.00	--	--	see text
gamma-Chlordane	0.0172	Travis and Arms 1988	4.00	Edwards and Bohlen 1992	--	see text
Heptachlor	0.0548	Travis and Arms 1988	3.00	Edwards and Bohlen 1992	--	see text
Heptachlor epoxide	0.3673	Travis and Arms 1988	8.39	USEPA 1999	--	see text
Methoxychlor	0.1447	Travis and Arms 1988	1.00	--	--	see text

TABLE L-22
Soil Bioconcentration and Bioaccumulation Factors For Plants, Soil Invertebrates, and Small Mammals - Step 2
SWMU 6 Former NASD, Vieques Island, Puerto Rico

Chemical	Soil-Plant BCF (dry weight)		Soil-Invertebrate BAF (dry weight)		Soil-Rat BAF (dry weight)	
	Value	Reference	Value	Reference	Value *	Reference
Toxaphene	0.1217	Travis and Arms 1988	1.00	--	--	see text
Semivolatile Organics						
1,2,4-Trichlorobenzene	0.2186	Travis and Arms 1988	0.56	Beyer 1996	--	see text
1,2-Dichlorobenzene	0.5475	Travis and Arms 1988	1.00	--	--	see text
1,3-Dichlorobenzene	0.3673	Travis and Arms 1988	1.00	--	--	see text
1,4-Dichlorobenzene	0.5055	Travis and Arms 1988	1.00	--	--	see text
4-Bromophenyl-phenylether	0.0578	Travis and Arms 1988	1.00	--	--	see text
4-Chlorophenyl-phenylether	0.1697	Travis and Arms 1988	1.00	--	--	see text
Acenaphthene	0.2564	Travis and Arms 1988	0.30	Beyer and Stafford 1993	--	see text
Acenaphthylene	0.1653	Travis and Arms 1988	0.22	Beyer and Stafford 1993	--	see text
Anthracene	0.1051	Travis and Arms 1988	0.32	Beyer and Stafford 1993	--	see text
Benzo(a)anthracene	0.0222	Travis and Arms 1988	0.27	Beyer and Stafford 1993	--	see text
Benzo(a)pyrene	0.0135	Travis and Arms 1988	0.34	Beyer and Stafford 1993	--	see text
Benzo(b)fluoranthene	0.0174	Travis and Arms 1988	0.21	Beyer and Stafford 1993	--	see text
Benzo(g,h,i)perylene	0.0061	Travis and Arms 1988	0.15	Beyer and Stafford 1993	--	see text
Benzo(k)fluoranthene	0.0112	Travis and Arms 1988	0.21	Beyer and Stafford 1993	--	see text
Chrysene	0.0289	Travis and Arms 1988	0.44	Beyer and Stafford 1993	--	see text
Dibenz(a,h)anthracene	0.0068	Travis and Arms 1988	0.49	Beyer and Stafford 1993	--	see text
Fluoranthene	0.0617	Travis and Arms 1988	0.37	Beyer and Stafford 1993	--	see text
Fluorene	0.1790	Travis and Arms 1988	0.20	Beyer and Stafford 1993	--	see text
Hexachlorobenzene	0.0367	Travis and Arms 1988	1.69	Beyer 1996	--	see text
Hexachlorobutadiene	0.0705	Travis and Arms 1988	1.00	--	--	see text
Hexachlorocyclopentadiene	0.0467	Travis and Arms 1988	1.00	--	--	see text
Hexachloroethane	0.2399	Travis and Arms 1988	1.00	--	--	see text
Indeno(1,2,3-cd)pyrene	0.0061	Travis and Arms 1988	0.41	Beyer and Stafford 1993	--	see text
Pentachlorophenol	0.0492	Travis and Arms 1988	8.00	van Gestel and Ma 1988	--	see text
Phenanthrene	0.1154	Travis and Arms 1988	0.28	Beyer and Stafford 1993	--	see text
Pyrene	0.0687	Travis and Arms 1988	0.39	Beyer and Stafford 1993	--	see text
Volatile Organics						
1,1,2,2-Tetrachloroethane	1.7899	Travis and Arms 1988	1.00	--	--	see text

* - Omnivore BAF values used.

TABLE L-23
Sediment Bioaccumulation Factors For Benthic Invertebrates and Fish - Step 2
SWMU 6 Former NASD, Vieques Island, Puerto Rico

Chemical	Sediment-Invertebrate BAF (dry weight)		Sediment-Fish BAF (dry weight)	
	Value	Reference	Value	Reference
Inorganics				
Arsenic	0.690	Bechtel Jacobs 1998b	0.126	Pascoe et al. 1996
Cadmium	3.073	Bechtel Jacobs 1998b	0.164	Pascoe et al. 1996
Chromium	0.186	Bechtel Jacobs 1998b	0.038	Krantzberg and Boyd 1992
Copper	7.957	Bechtel Jacobs 1998b	0.100	Krantzberg and Boyd 1992
Lead	0.326	Bechtel Jacobs 1998b	0.070	Krantzberg and Boyd 1992
Mercury	2.868	Bechtel Jacobs 1998b	4.580	Cope et al. 1990
Nickel	0.214	Bechtel Jacobs 1998b	1.000	--
Selenium	1.000	--	1.000	--
Silver	0.180	Hirsch 1998	1.000	--
Zinc	4.759	Bechtel Jacobs 1998b	0.147	Pascoe et al. 1996
Pesticides/PCBs				
4,4'-DDD	0.350	Oliver and Niimi 1988	2.250	Oliver and Niimi 1988
4,4'-DDE	3.360	Oliver and Niimi 1988	26.20	Oliver and Niimi 1988
4,4'-DDT	2.280	Oliver and Niimi 1988	8.800	Oliver and Niimi 1988
Aldrin	1.000	--	1.000	--
alpha-BHC	1.000	--	1.000	--
alpha-Chlordane	1.000	--	1.000	--
Aroclor-1016	21.89	Bechtel Jacobs 1998b	12.94	Oliver and Niimi 1988
Aroclor-1221	21.89	Bechtel Jacobs 1998b	12.94	Oliver and Niimi 1988
Aroclor-1232	21.89	Bechtel Jacobs 1998b	12.94	Oliver and Niimi 1988
Aroclor-1242	21.89	Bechtel Jacobs 1998b	12.94	Oliver and Niimi 1988
Aroclor-1248	21.89	Bechtel Jacobs 1998b	12.94	Oliver and Niimi 1988
Aroclor-1254	21.89	Bechtel Jacobs 1998b	12.94	Oliver and Niimi 1988
Aroclor-1260	21.89	Bechtel Jacobs 1998b	12.94	Oliver and Niimi 1988
beta-BHC	1.000	--	1.000	--
delta-BHC	1.000	--	1.000	--
Dieldrin	4.520	Standley 1997	1.000	--
Endosulfan I	1.000	--	1.000	--
Endosulfan II	1.000	--	1.000	--
Endrin	1.000	--	1.000	--
gamma-BHC (Lindane)	1.000	--	6.200	Oliver and Niimi 1988
gamma-Chlordane	1.000	--	1.000	--
Heptachlor	1.000	--	1.000	--
Heptachlor epoxide	1.000	--	1.000	--
Methoxychlor	1.000	--	1.000	--
Toxaphene	1.000	--	1.000	--
Semivolatile Organics				

TABLE L-23
Sediment Bioaccumulation Factors For Benthic Invertebrates and Fish - Step 2
SWMU 6 Former NASD, Vieques Island, Puerto Rico

Chemical	Sediment-Invertebrate BAF (dry weight)		Sediment-Fish BAF (dry weight)	
	Value	Reference	Value	Reference
1,2,4-Trichlorobenzene	0.480	Oliver and Niimi 1988	0.074	Parkerton et al. 1993
1,2-Dichlorobenzene	1.000	--	0.085	Parkerton et al. 1993
1,3-Dichlorobenzene	1.000	--	0.085	Parkerton et al. 1993
1,4-Dichlorobenzene	1.000	--	0.085	Parkerton et al. 1993
4-Bromophenyl-phenylether	1.000	--	1.000	--
4-Chlorophenyl-phenylether	1.000	--	1.000	--
Acenaphthene	2.040	Maruya et al. 1997	1.000	--
Acenaphthylene	2.040	Acenaphthene value	1.000	--
Anthracene	0.271	Maruya et al. 1997	1.000	--
Benzo(a)anthracene	1.400	Maruya et al. 1997	1.000	--
Benzo(a)pyrene	0.191	Maruya et al. 1997	1.000	--
Benzo(b)fluoranthene	0.160	Maruya et al. 1997	1.000	--
Benzo(g,h,i)perylene	0.295	Maruya et al. 1997	1.000	--
Benzo(k)fluoranthene	0.421	Maruya et al. 1997	1.000	--
Chrysene	0.335	Maruya et al. 1997	1.000	--
Dibenz(a,h)anthracene	0.271	Anthracene value	1.000	--
Fluoranthene	0.312	Maruya et al. 1997	1.000	--
Fluorene	1.130	Maruya et al. 1997	1.000	--
Hexachlorobenzene	0.860	Oliver and Niimi 1988	0.940	Oliver and Niimi 1988
Hexachlorobutadiene	0.610	Oliver and Niimi 1988	0.384	Parkerton et al. 1993
Hexachlorocyclopentadiene	1.000	--	1.000	--
Hexachloroethane	1.000	--	1.000	--
Indeno(1,2,3-cd)pyrene	0.355	Maruya et al. 1997	1.000	--
Pentachlorophenol	1.000	--	1.000	--
Phenanthrene	0.652	Maruya et al. 1997	1.000	--
Pyrene	0.803	Maruya et al. 1997	1.000	--
Volatile Organics				
1,1,2,2-Tetrachloroethane	1.000	--	1.000	--

TABLE L-24
Exposure Parameters for Upper Trophic Level Ecological Receptors - Step 2
SWMU 6 Former NASD, Vieques Island, Puerto Rico

Receptor	Body Weight (kg)		Water Ingestion Rate (L/day)		Food Ingestion Rate (kg/day - dry)	
	Value	Reference	Value	Reference	Value	Reference
Birds						
Pearly-eyed thrasher	0.095	Oberle 2000	0.0127	allometric equation	0.0131	allometric equation
Green heron	0.158	Sample et al. 1997	0.0227	allometric equation	0.0458	allometric equation
Red-tailed hawk	0.957	EPA 1993	0.0680	allometric equation	0.0395	Sample and Suter 1994
Spotted sandpiper	0.029	Dunning 1993	0.0089	allometric equation	0.0093	allometric equation
Mammals						
Norway rat	0.250	Pass and Freeth 1993	0.0810	allometric equation	0.0270	allometric equation
Indian Mongoose	0.305	Nellis 1989	0.0683	allometric equation	0.0489	allometric equation

TABLE L-24
Exposure Parameters for Upper Trophic Level Ecological Receptors - Step 2
SWMU 6 Former NASD, Vieques Island, Puerto Rico

Receptor	Dietary Composition (percent)							Soil/ Sediment Ingestion (percent)	
	Terr. Plants	Soil Invert.	Small Mammals	Fish	Aquatic Plants	Benthic Invert.	Reference	Value	Reference
Birds									
Pearly-eyed thrasher	20	75	0	0	0	0	Oberle 2000; estimated based on description of diet	4.6	Sample and Suter 1994; value is for American robin
Green heron	0	0	0	71	0	29	Sample et al. 1997	0	Sample et al. 1997
Red-tailed hawk	0	0	100	0	0	0	EPA 1993a; Sample and Suter 1994	0	Sample and Suter 1994
Spotted sandpiper	0	0	0	0	0	82	EPA 1993a	18	Beyer et al. 1994
Mammals									
Norway rat	50	50	0	0	0	0	Linzey, 1998; estimated based on description of diet	2.0	Beyer et al. 1994; value is for deer mouse
Indian Mongoose	11	68	2.6	0	0	3.2	Nellis 1989	13	Sample and Suter 1994; value is for short-tailed shrew

TABLE L-25
Ingestion Screening Values for Mammals
SWMU 6 Former NASD, Vieques Island, Puerto Rico

Chemical	Test Organism	Body Weight (kg)	Duration	Exposure Route	Effect/Endpoint	LOAEL (mg/kg/d)	NOAEL (mg/kg/d)	Reference
Inorganics								
Arsenic	mouse	0.03	3 generations	oral in water	reproduction	1.26	0.25	Sample et al. 1996
Arsenic	dog	10.0	2 years	oral in diet	systemic	6.00	1.20	ATSDR 1993a
Cadmium	rat	0.303	6 weeks	oral (gavage)	reproduction	10.0	1.00	Sample et al. 1996
Cadmium	dog	10.0	3 months	oral in diet	reproduction	3.75	0.75	ATSDR 1999a
Chromium	rat	0.35	1 year	oral in water	body weight/intake	16.4	3.28	Sample et al. 1996
Copper	mouse	0.03	1 month + GD 0-19	oral in diet	developmental	104	78.0	ATSDR 1990a
Copper	mink	1.00	357 days	oral in diet	reproduction	15.1	11.7	Sample et al. 1996
Lead	rat	0.35	3 generations	oral in diet	reproduction	80.0	8.00	Sample et al. 1996
Mercury	rat	0.35	3 generations	oral in diet	reproduction	0.16	0.032	Sample et al. 1996
Mercury	mink	1.00	93 days	oral in diet	survival/weight loss	0.25	0.15	Sample et al. 1996
Nickel	rat	0.35	3 generations	oral in diet	reproduction	80.0	40.0	Sample et al. 1996
Nickel	dog	10.0	2 years	oral in diet	systemic	62.5	25.0	ATSDR 1997a
Selenium	rat	0.35	1 year	oral in water	reproduction	0.33	0.20	Sample et al. 1996
Silver	rat	0.35	2 weeks	oral in water	survival	45.3	9.06	ATSDR 1990b
Zinc	rat	0.35	GD 1-16	oral in diet	reproduction	320	160	Sample et al. 1996
Zinc	mink	1.00	25 weeks	oral	reproduction	104	20.8	ATSDR 1994a
Pesticides/PCBs								
4,4'-DDD	rat	0.35	2 years	oral in diet	reproduction	4.00	0.80	Sample et al. 1996
4,4'-DDD	dog	10.0	2 generations	oral in diet	reproduction	5.00	1.00	ATSDR 1994b
4,4'-DDE	rat	0.35	2 years	oral in diet	reproduction	4.00	0.80	Sample et al. 1996
4,4'-DDE	dog	10.0	2 generations	oral in diet	reproduction	5.00	1.00	ATSDR 1994b
4,4'-DDT	rat	0.35	2 years	oral in diet	reproduction	4.00	0.80	Sample et al. 1996
4,4'-DDT	dog	10.0	2 generations	oral in diet	reproduction	5.00	1.00	ATSDR 1994b
Aldrin	rat	0.35	3 generations	oral in diet	reproduction	1.00	0.20	Sample et al. 1996
alpha-BHC	rat	0.35	4 generations	oral in diet	reproduction	3.20	1.60	Sample et al. 1996
alpha-Chlordane	mouse	0.03	6 generations	oral in diet	reproduction	9.16	4.58	Sample et al. 1996
Aroclor-1016	oldfield mouse	0.014	12 months	oral in diet	reproduction	0.68	0.14	Sample et al. 1996

TABLE L-25
Ingestion Screening Values for Mammals
SWMU 6 Former NASD, Vieques Island, Puerto Rico

Chemical	Test Organism	Body Weight (kg)	Duration	Exposure Route	Effect/Endpoint	LOAEL (mg/kg/d)	NOAEL (mg/kg/d)	Reference
Aroclor-1016	mink	1.00	18 months	oral in diet	reproduction	3.43	1.37	Sample et al. 1996
Aroclor-1221	oldfield mouse	0.014	12 months	oral in diet	reproduction	0.68	0.14	Sample et al. 1996
Aroclor-1221	mink	1.00	7 months	oral in diet	reproduction	0.69	0.14	Sample et al. 1996
Aroclor-1232	oldfield mouse	0.014	12 months	oral in diet	reproduction	0.68	0.14	Sample et al. 1996
Aroclor-1232	mink	1.00	7 months	oral in diet	reproduction	0.69	0.14	Sample et al. 1996
Aroclor-1242	oldfield mouse	0.014	12 months	oral in diet	reproduction	0.68	0.14	Sample et al. 1996
Aroclor-1242	mink	1.00	7 months	oral in diet	reproduction	0.69	0.14	Sample et al. 1996
Aroclor-1248	oldfield mouse	0.014	12 months	oral in diet	reproduction	0.68	0.14	Sample et al. 1996
Aroclor-1248	mink	1.00	4.5 months	oral in diet	reproduction	0.69	0.14	Sample et al. 1996
Aroclor-1254	oldfield mouse	0.014	12 months	oral in diet	reproduction	0.68	0.14	Sample et al. 1996
Aroclor-1254	mink	1.00	4.5 months	oral in diet	reproduction	0.69	0.14	Sample et al. 1996
Aroclor-1260	oldfield mouse	0.014	12 months	oral in diet	reproduction	0.68	0.14	Sample et al. 1996
Aroclor-1260	mink	1.00	4.5 months	oral in diet	reproduction	0.69	0.14	Sample et al. 1996
beta-BHC	rat	0.35	4 generations	oral in diet	reproduction	3.20	1.60	Sample et al. 1996
delta-BHC	rat	0.35	4 generations	oral in diet	reproduction	3.20	1.60	Sample et al. 1996
Dieldrin	rat	0.35	3 generations	oral in diet	reproduction	0.20	0.04	Sample et al. 1996
Dieldrin	dog	10	15.7 months	oral in diet	systemic	0.14	0.03	ATSDR 1993b
Endosulfan I	rat	0.35	30 days	oral (gavage)	fertility	7.50	1.50	Sample et al. 1996
Endosulfan I	dog	10.0	2 years	oral in diet	systemic	5.00	1.00	ATSDR 1993c
Endosulfan II	rat	0.35	30 days	oral (gavage)	fertility	7.50	1.50	Sample et al. 1996
Endosulfan II	dog	10.0	2 years	oral in diet	systemic	5.00	1.00	ATSDR 1993c
Endrin	mouse	0.03	120 days	oral in diet	reproduction	0.92	0.18	Sample et al. 1996
gamma-BHC (Lindane)	rat	0.35	3 generations	oral in diet	reproduction	40.0	8.00	Sample et al. 1996
gamma-Chlordane	mouse	0.03	6 generations	oral in diet	reproduction	9.16	4.58	Sample et al. 1996
Heptachlor	mouse	0.03	70 days	oral in diet	reproduction	1.63	0.33	ATSDR 1993d
Heptachlor	mink	1.00	181 days	oral in diet	reproduction	1.00	0.20	Sample et al. 1996
Heptachlor epoxide	mouse	0.03	70 days	oral in diet	reproduction	1.63	0.33	ATSDR 1993d
Heptachlor epoxide	mink	1.00	181 days	oral in diet	reproduction	1.00	0.20	Sample et al. 1996

TABLE L-25
Ingestion Screening Values for Mammals
SWMU 6 Former NASD, Vieques Island, Puerto Rico

Chemical	Test Organism	Body Weight (kg)	Duration	Exposure Route	Effect/Endpoint	LOAEL (mg/kg/d)	NOAEL (mg/kg/d)	Reference
Methoxychlor	rat	0.35	11 months	oral in diet	reproduction	8.00	4.00	Sample et al. 1996
Toxaphene	rat	0.35	3 generations	oral in diet	reproduction	40.0	8.00	Sample et al. 1996
Semivolatile Organics								
1,2,4-Trichlorobenzene	rat	0.35	3 generations	oral in water	reproduction	106	53	Coulston and Kolbye 1994
1,2-Dichlorobenzene	rat	0.35	chronic	oral (gavage)	liver/kidney	429	85.7	Coulston and Kolbye 1994
1,3-Dichlorobenzene	rat	0.35	chronic	oral (gavage)	liver/kidney	429	85.7	Coulston and Kolbye 1994
1,4-Dichlorobenzene	rat	0.35	GD 6-15	oral (gavage)	developmental	500	250	ATSDR 1998a
4-Bromophenyl-phenylether	--	--	--	--	--	NA	NA	--
4-Chlorophenyl-phenylether	--	--	--	--	--	NA	NA	--
Acenaphthene	mouse	0.03	13 weeks	oral (gavage)	reproduction	700	350	ATSDR 1995a
Acenaphthylene	mouse	0.03	13 weeks	oral (gavage)	reproduction	700	350	ATSDR 1995a
Anthracene	mouse	0.03	13 weeks	oral (gavage)	reproduction	5,000	1,000	ATSDR 1995a
Benzo(a)anthracene	mouse	0.03	GD 7-16	oral (gavage)	reproduction	10.0	2.00	Sample et al. 1996
Benzo(a)pyrene	mouse	0.03	GD 7-16	oral (gavage)	reproduction	10.0	2.00	Sample et al. 1996
Benzo(b)fluoranthene	mouse	0.03	GD 7-16	oral (gavage)	reproduction	10.0	2.00	Sample et al. 1996
Benzo(g,h,i)perylene	mouse	0.03	GD 7-16	oral (gavage)	reproduction	10.0	2.00	Sample et al. 1996
Benzo(k)fluoranthene	mouse	0.03	GD 7-16	oral (gavage)	reproduction	10.0	2.00	Sample et al. 1996
Chrysene	mouse	0.03	GD 7-16	oral (gavage)	reproduction	10.0	2.00	Sample et al. 1996
Dibenz(a,h)anthracene	mouse	0.03	GD 7-16	oral (gavage)	reproduction	10.0	2.00	Sample et al. 1996
Fluoranthene	mouse	0.03	13 weeks	oral (gavage)	reproduction	2,500	500	ATSDR 1995a
Fluorene	mouse	0.03	13 weeks	oral (gavage)	reproduction	2,500	500	ATSDR 1995a
Hexachlorobenzene	rat	0.35	4 generations	oral in diet	reproduction	2.00	1.00	ATSDR 1996b
Hexachlorobenzene	dog	10.0	1 year	oral	systemic	12.0	1.20	ATSDR 1996b
Hexachlorobutadiene	rat	0.35	GD 1-22; LD 1-21	oral in diet	developmental	20.0	2.00	ATSDR 1994c
Hexachlorocyclopentadiene	mouse	0.03	GD 6-15	oral (gavage)	developmental	375	75.0	ATSDR 1999b
Hexachloroethane	rat	0.35	GD 6-16	oral (gavage)	reproduction	500	100	ATSDR 1997b
Indeno(1,2,3-cd)pyrene	mouse	0.03	GD 7-16	oral (gavage)	reproduction	10.0	2.00	Sample et al. 1996
Pentachlorophenol	rat	0.35	2 generations	oral in diet	developmental	25.0	5.00	ATSDR 1994d

TABLE L-25
Ingestion Screening Values for Mammals
SWMU 6 Former NASD, Vieques Island, Puerto Rico

Chemical	Test Organism	Body Weight (kg)	Duration	Exposure Route	Effect/Endpoint	LOAEL (mg/kg/d)	NOAEL (mg/kg/d)	Reference
Phenanthrene	mouse	0.03	13 weeks	oral (gavage)	reproduction	2,500	500	ATSDR 1995a
Pyrene	mouse	0.03	GD 7-16	oral (gavage)	reproduction	10.0	2.00	Sample et al. 1996
Volatile Organics								
1,1,2,2-Tetrachloroethane	rat	0.35	78 weeks	oral (gavage)	reproduction	380	76.0	ATSDR 1996a

TABLE L-26
Ingestion Screening Values for Birds
SWMU 6 Former NASD, Vieques Island, Puerto Rico

Chemical	Test Organism	Body Weight (kg)	Duration	Exposure Route	Effect/Endpoint	LOAEL (mg/kg/d)	NOAEL (mg/kg/d)	Reference
Inorganics								
Arsenic	brown-headed cowbird	0.049	7 months	oral in diet	survival	7.38	2.46	Sample et al. 1996
Arsenic	mallard	1.00	128 days	oral in diet	survival	12.8	5.14	Sample et al. 1996
Cadmium	mallard	1.15	90 days	oral in diet	reproduction	20.0	1.45	Sample et al. 1996
Chromium	American black duck	1.25	10 months	oral in diet	reproduction	5.00	1.00	Sample et al. 1996
Copper	chicken (chicks)	0.534	10 weeks	oral in diet	growth/survival	61.7	47.0	Sample et al. 1996
Lead	Japanese quail	0.15	12 weeks	oral in diet	reproduction	11.3	1.13	Sample et al. 1996
Lead	American kestrel	0.13	7 months	oral in diet	reproduction	19.3	3.85	Sample et al. 1996
Mercury	red-tailed hawk	1.10	12 weeks	oral in diet	survival/neurological	1.20	0.49	USEPA 1995b
Mercury	mallard	1.00	3 generations	oral in diet	reproduction	0.078	0.026	USEPA 1997b
Nickel	mallard	0.782	90 days	oral in diet	growth/survival	107	77.4	Sample et al. 1996
Selenium	heron	0.88	94 days	oral in diet	reproduction	9.00	1.80	Sample et al. 1996
Selenium	mallard	1.00	100 days	oral in diet	reproduction	0.80	0.40	Sample et al. 1996
Selenium	screech owl	0.20	13.7 weeks	oral in diet	reproduction	1.50	0.44	Sample et al. 1996
Silver	mallard	1.10	14 days	oral in diet	survival	178	35.6	USEPA 1999
Silver	chicken (chicks)	0.80	not specified	oral in diet	growth	35.0	7.00	Eisler 1996
Zinc	chicken	1.94	44 weeks	oral in diet	reproduction	131	14.5	Sample et al. 1996
Pesticides/PCBs								
4,4'-DDD	Japanese quail	0.11	3 generations	oral in diet	reproduction	5.00	0.50	USEPA 1995b
4,4'-DDD	barn owl	0.47	2 years	oral in diet	reproduction	0.40	0.08	Blus 1996
4,4'-DDD	mallard	1.00	2 years	oral in diet	reproduction	0.60	0.12	USEPA 1995b
4,4'-DDD	bald eagle	4.74	112 days	oral in diet	survival	3.00	0.30	USEPA 1995b
4,4'-DDE	Japanese quail	0.11	3 generations	oral in diet	reproduction	5.00	0.50	USEPA 1995b
4,4'-DDE	barn owl	0.47	2 years	oral in diet	reproduction	0.40	0.08	Blus 1996
4,4'-DDE	mallard	1.00	2 years	oral in diet	reproduction	0.60	0.12	USEPA 1995b
4,4'-DDE	bald eagle	4.74	112 days	oral in diet	survival	3.00	0.30	USEPA 1995b
4,4'-DDT	Japanese quail	0.11	3 generations	oral in diet	reproduction	5.00	0.50	USEPA 1995b
4,4'-DDT	barn owl	0.47	2 years	oral in diet	reproduction	0.40	0.08	Blus 1996
4,4'-DDT	mallard	1.00	2 years	oral in diet	reproduction	1.50	0.60	USEPA 1995b
4,4'-DDT	bald eagle	4.74	112 days	oral in diet	survival	3.00	0.30	USEPA 1995b
Aldrin	ring-necked pheasant	1.14	5 days	oral in diet	survival	0.35	0.07	Hill et al. 1975

TABLE L-26
Ingestion Screening Values for Birds
SWMU 6 Former NASD, Vieques Island, Puerto Rico

Chemical	Test Organism	Body Weight (kg)	Duration	Exposure Route	Effect/Endpoint	LOAEL (mg/kg/d)	NOAEL (mg/kg/d)	Reference
Aldrin	mallard	1.00	5 days	oral in diet	survival	0.78	0.16	Hill et al. 1975
alpha-BHC	Japanese quail	0.15	90 days	oral in diet	reproduction	2.25	0.56	Sample et al. 1996
alpha-Chlordane	red-winged blackbird	0.064	84 days	oral in diet	survival	10.7	2.14	Sample et al. 1996
alpha-Chlordane	mallard	1.00	not specified	oral in diet	reproduction	4.00	0.80	Wiemeyer 1996
Aroclor-1016	screech owl	0.181	2 generations	oral in diet	reproduction	2.05	0.41	Sample et al. 1996
Aroclor-1016	mallard	1.00	1 month	oral in diet	reproduction	7.50	1.50	USEPA 1995b
Aroclor-1221	screech owl	0.181	2 generations	oral in diet	reproduction	2.05	0.41	Sample et al. 1996
Aroclor-1221	mallard	1.00	1 month	oral in diet	reproduction	7.50	1.50	USEPA 1995b
Aroclor-1232	screech owl	0.181	2 generations	oral in diet	reproduction	2.05	0.41	Sample et al. 1996
Aroclor-1232	mallard	1.00	1 month	oral in diet	reproduction	7.50	1.50	USEPA 1995b
Aroclor-1242	screech owl	0.181	2 generations	oral in diet	reproduction	2.05	0.41	Sample et al. 1996
Aroclor-1242	mallard	1.00	1 month	oral in diet	reproduction	7.50	1.50	USEPA 1995b
Aroclor-1248	screech owl	0.181	2 generations	oral in diet	reproduction	2.05	0.41	Sample et al. 1996
Aroclor-1248	mallard	1.00	1 month	oral in diet	reproduction	7.50	1.50	USEPA 1995b
Aroclor-1254	screech owl	0.181	2 generations	oral in diet	reproduction	2.05	0.41	Sample et al. 1996
Aroclor-1254	mallard	1.00	1 month	oral in diet	reproduction	7.50	1.50	USEPA 1995b
Aroclor-1260	screech owl	0.181	2 generations	oral in diet	reproduction	2.05	0.41	Sample et al. 1996
Aroclor-1260	mallard	1.00	1 month	oral in diet	reproduction	7.50	1.50	USEPA 1995b
beta-BHC	Japanese quail	0.15	90 days	oral in diet	reproduction	2.25	0.56	Sample et al. 1996
delta-BHC	Japanese quail	0.15	90 days	oral in diet	reproduction	2.25	0.56	Sample et al. 1996
Dieldrin	barn owl	0.466	2 years	oral in diet	reproduction	0.39	0.08	Sample et al. 1996
Endosulfan I	gray partridge	0.40	4 weeks	oral in diet	reproduction	50.0	10.0	Sample et al. 1996
Endosulfan II	gray partridge	0.40	4 weeks	oral in diet	reproduction	50.0	10.0	Sample et al. 1996
Endrin	mallard	1.15	>200 days	oral in diet	reproduction	1.50	0.30	Sample et al. 1996
Endrin	screech owl	0.181	>83 days	oral in diet	reproduction	0.10	0.02	Sample et al. 1996
gamma-BHC (Lindane)	mallard	1.00	8 weeks	oral (gavage)	reproduction	20.0	4.00	Sample et al. 1996
gamma-Chlordane	red-winged blackbird	0.064	84 days	oral in diet	survival	10.7	2.14	Sample et al. 1996
gamma-Chlordane	mallard	1.00	not specified	oral in diet	reproduction	4.00	0.80	Wiemeyer 1996
Heptachlor	ring-necked pheasant	1.14	5 days	oral in diet	survival	1.38	0.28	Hill et al. 1975

TABLE L-26
Ingestion Screening Values for Birds
SWMU 6 Former NASD, Vieques Island, Puerto Rico

Chemical	Test Organism	Body Weight (kg)	Duration	Exposure Route	Effect/Endpoint	LOAEL (mg/kg/d)	NOAEL (mg/kg/d)	Reference
Heptachlor	mallard	1.00	5 days	oral in diet	survival	2.40	0.48	Hill et al. 1975
Heptachlor epoxide	ring-necked pheasant	1.14	5 days	oral in diet	survival	1.38	0.28	Hill et al. 1975
Heptachlor epoxide	mallard	1.00	5 days	oral in diet	survival	2.40	0.48	Hill et al. 1975
Methoxychlor	chicken	1.50	16 weeks	oral in diet	reproduction	1,775	355	Wiemeyer 1996
Toxaphene	American black duck	1.00	2 seasons	oral in diet	reproduction	5.00	1.00	Wiemeyer 1996
Semivolatile Organics								
1,2,4-Trichlorobenzene	northern bobwhite	0.19	14 days	oral	survival	161	32.2	TERRETOX 2002
1,2-Dichlorobenzene	northern bobwhite	0.19	14 days	oral	survival	161	32.2	TERRETOX 2002
1,3-Dichlorobenzene	northern bobwhite	0.19	14 days	oral	survival	161	32.2	TERRETOX 2002
1,4-Dichlorobenzene	northern bobwhite	0.19	14 days	oral	survival	161	32.2	TERRETOX 2002
Acenaphthene	chicken	1.50	35 days	oral in diet	reproduction	35.5	7.10	Rigdon and Neal 1963
Acenaphthylene	chicken	1.50	35 days	oral in diet	reproduction	35.5	7.10	Rigdon and Neal 1963
Anthracene	chicken	1.50	35 days	oral in diet	reproduction	35.5	7.10	Rigdon and Neal 1963
Benzo(a)anthracene	chicken	1.50	35 days	oral in diet	reproduction	35.5	7.10	Rigdon and Neal 1963
Benzo(a)pyrene	chicken	1.50	35 days	oral in diet	reproduction	35.5	7.10	Rigdon and Neal 1963
Benzo(b)fluoranthene	chicken	1.50	35 days	oral in diet	reproduction	35.5	7.10	Rigdon and Neal 1963
Benzo(g,h,i)perylene	chicken	1.50	35 days	oral in diet	reproduction	35.5	7.10	Rigdon and Neal 1963
Benzo(k)fluoranthene	chicken	1.50	35 days	oral in diet	reproduction	35.5	7.10	Rigdon and Neal 1963
Chrysene	chicken	1.50	35 days	oral in diet	reproduction	35.5	7.10	Rigdon and Neal 1963
Dibenz(a,h)anthracene	chicken	1.50	35 days	oral in diet	reproduction	35.5	7.10	Rigdon and Neal 1963
Fluoranthene	chicken	1.50	35 days	oral in diet	reproduction	35.5	7.10	Rigdon and Neal 1963
Fluorene	chicken	1.50	35 days	oral in diet	reproduction	35.5	7.10	Rigdon and Neal 1963
Hexachlorobenzene	Japanese quail	0.15	90 days	oral in diet	reproduction	0.565	0.113	TERRETOX 2002
Hexachlorobutadiene	Japanese quail	0.15	90 days	oral in diet	reproduction	17.0	3.39	TERRETOX 2002
Hexachlorocyclopentadiene	--	--	--	--	--	NA	NA	--
Hexachloroethane	--	--	--	--	--	NA	NA	--
Indeno(1,2,3-cd)pyrene	chicken	1.50	35 days	oral in diet	reproduction	35.5	7.10	Rigdon and Neal 1963
Pentachlorophenol	chicken	1.50	8 weeks	oral in diet	systemic/growth	8.52	4.26	Eisler 1989
Phenanthrene	chicken	1.50	35 days	oral in diet	reproduction	35.5	7.10	Rigdon and Neal 1963
Pyrene	chicken	1.50	35 days	oral in diet	reproduction	35.5	7.10	Rigdon and Neal 1963
Volatile Organics								

TABLE L-26
Ingestion Screening Values for Birds
SWMU 6 Former NASD, Vieques Island, Puerto Rico

Chemical	Test Organism	Body Weight (kg)	Duration	Exposure Route	Effect/Endpoint	LOAEL (mg/kg/d)	NOAEL (mg/kg/d)	Reference
1,1,2,2-Tetrachloroethane	--	--	--	--	--	NA	NA	--

TABLE L-27
Step 2 Screening Statistics and COPC Selection - SWMU 6 - Surface Soil
SWMU 6 Former NASD, Vieques Island, Puerto Rico

Chemical	Detection Limit Range for Non-detects	Frequency of Detection	Maximum Concentration Detected	Sample ID of Maximum Concentration	Screening Value	Frequency of Exceedance	Maximum Hazard Quotient[1]	COPC?
Inorganics (MG/KG)								
ALUMINUM	-- - --	23 / 23	14000	NDA113	50	23 / 23	280	**YES**
ANTIMONY	0.15 - 0.19	19 / 23	13.3	NDA101	5	1 / 23	2.66	**YES**
ARSENIC	-- - --	23 / 23	7.9	NDW06SS23-R01	10	0 / 23	0.79	NO
BARIUM	-- - --	23 / 23	37.6	NDA117	500	0 / 23	0.08	NO
BERYLLIUM	0.041 - 0.042	21 / 23	0.12	NDA109, NDA113	10	0 / 23	0.01	NO
CADMIUM	0.0165 - 0.025	20 / 23	1.4	NDA109	4	0 / 23	0.35	NO
CALCIUM [2]	-- - --	23 / 23	165000	NDW06SS20-R01	NSV	-- / --	NSV	NO
CHROMIUM, TOTAL	-- - --	23 / 23	42.9	NDA113	0.4	23 / 23	107	**YES**
COBALT	-- - --	23 / 23	12.8	NDA113	20	0 / 23	0.64	NO
COPPER	-- - --	23 / 23	275	NDW06SS13-R01	50	7 / 23	5.50	**YES**
IRON	-- - --	23 / 23	93200	NDW06SS23-R01	200	23 / 23	466	**YES**
LEAD	-- - --	23 / 23	617	NDA101	50	6 / 23	12.34	**YES**
MAGNESIUM [2]	-- - --	23 / 23	9050	NDA113	NSV	-- / --	NSV	NO
MANGANESE	-- - --	23 / 23	741	NDW06SS23-R01	100	13 / 23	7.41	**YES**
MERCURY	0.013 - 0.019	18 / 23	0.081	NDA101, NDA107	0.1	0 / 23	0.81	NO
NICKEL	-- - --	23 / 23	20	NDA113	30	0 / 23	0.67	NO
POTASSIUM [2]	-- - --	23 / 23	2890	NDW06SS16-R01	NSV	-- / --	NSV	NO
SELENIUM	0.222 - 0.358	2 / 23	0.435	NDW06SS14-R01	1	0 / 23	0.44	NO
SILVER	0.0269 - 0.069	9 / 23	0.41	NDA113	2	0 / 23	0.21	NO
SODIUM [2]	-- - --	23 / 23	14200	NDA111	NSV	-- / --	NSV	NO
THALLIUM	0.136 - 0.37	3 / 23	4.3	NDA101	1	1 / 23	4.30	**YES**
VANADIUM	-- - --	23 / 23	71.4	NDW06SS21-R01	2	23 / 23	36	**YES**
ZINC	-- - --	23 / 23	438	NDA101	50	10 / 23	8.76	**YES**
Pesticides/Polychlorinated Biphenyls (MG/KG)								
PCB-1016 (AROCHLOR 1016)	0.038 - 0.56	0 / 23	--	--	40	-- / --	0.01	NO
PCB-1221 (AROCHLOR 1221)	0.076 - 1.1	0 / 23	--	--	40	-- / --	0.03	NO
PCB-1232 (AROCHLOR 1232)	0.038 - 0.56	0 / 23	--	--	40	-- / --	0.01	NO
PCB-1242 (AROCHLOR 1242)	0.038 - 0.56	0 / 23	--	--	40	-- / --	0.01	NO
PCB-1248 (AROCHLOR 1248)	0.038 - 0.56	0 / 23	--	--	40	-- / --	0.01	NO
PCB-1254 (AROCHLOR 1254)	0.038 - 0.56	1 / 23	0.043	NDW06SS23-R01	40	0 / 23	0.001	NO
PCB-1260 (AROCHLOR 1260)	0.038 - 0.56	0 / 23	--	--	40	-- / --	0.01	NO
ALDRIN	0.0019 - 0.029	0 / 23	--	--	0.0025	-- / --	12	--[3]

TABLE L-27
Step 2 Screening Statistics and COPC Selection - SWMU 6 - Surface Soil
SWMU 6 Former NASD, Vieques Island, Puerto Rico

Chemical	Detection Limit Range for Non-detects	Frequency of Detection	Maximum Concentration Detected	Sample ID of Maximum Concentration	Screening Value	Frequency of Exceedance	Maximum Hazard Quotient[1]	COPC?
ALPHA BHC (ALPHA HEXACHLORO	0.0019 - 0.029	0 / 23	--	--	0.0025	-- / --	12	--[3]
ALPHA ENDOSULFAN	0.0019 - 0.029	0 / 23	--	--	NSV	-- / --	NSV	NO
ALPHA-CHLORDANE	0.0019 - 0.029	1 / 23	0.00061	NDA113	NSV	-- / --	NSV	**YES**
BETA BHC (BETA HEXACHLOROCY	0.0019 - 0.029	0 / 23	--	--	0.001	-- / --	29	--[3]
BETA ENDOSULFAN	0.0038 - 0.056	0 / 23	--	--	NSV	-- / --	NSV	NO
DELTA BHC (DELTA HEXACHLORO	0.0019 - 0.029	0 / 23	--	--	NSV	-- / --	NSV	NO
DIELDRIN	0.0038 - 0.056	0 / 23	--	--	0.0005	-- / --	112	--[3]
ENDOSULFAN SULFATE	0.0038 - 0.056	0 / 23	--	--	NSV	-- / --	NSV	NO
ENDRIN	0.0038 - 0.056	0 / 23	--	--	0.001	-- / --	56	--[3]
ENDRIN ALDEHYDE	0.0038 - 0.048	1 / 23	0.011	NDW06SS19-R01	0.1	0 / 23	0.11	NO
ENDRIN KETONE	0.0038 - 0.056	0 / 23	--	--	0.1	-- / --	0.56	NO
GAMMA BHC (LINDANE)	0.0019 - 0.029	0 / 23	--	--	0.00005	-- / --	580	--[3]
GAMMA-CHLORDANE	0.0019 - 0.029	0 / 23	--	--	NSV	-- / --	NSV	NO
HEPTACHLOR	0.0019 - 0.029	0 / 23	--	--	NSV	-- / --	NSV	NO
HEPTACHLOR EPOXIDE	0.0019 - 0.029	0 / 23	--	--	NSV	-- / --	NSV	NO
METHOXYCHLOR	0.019 - 0.29	0 / 23	--	--	NSV	-- / --	NSV	NO
o,p'-DDD	0.0038 - 0.056	7 / 23	0.028	NDW06SS13-R01	0.0025	4 / 23	11	**YES**
o,p'-DDE	0.0043 - 0.056	12 / 23	0.074	NDA113	0.0025	9 / 23	30	**YES**
o,p'-DDT	0.0038 - 0.056	5 / 23	0.017	NDA113	0.0025	5 / 23	6.80	**YES**
TOXAPHENE	0.194 - 2.9	0 / 23	--	--	NSV	-- / --	NSV	NO
Semi-volatile Organic Compounds (MG/KG)								
1,2,4-TRICHLOROBENZENE	0.503 - 0.76	0 / 8	--	--	20	-- / --	0.04	NO
1,2-DICHLOROBENZENE	0.503 - 0.76	0 / 8	--	--	NSV	-- / --	NSV	NO
1,3-DICHLOROBENZENE	0.503 - 0.76	0 / 8	--	--	NSV	-- / --	NSV	NO
1,4-DICHLOROBENZENE	0.503 - 0.76	0 / 8	--	--	20	-- / --	0.04	NO
2,4,5-TRICHLOROPHENOL	1.25 - 2.28	0 / 23	--	--	4	-- / --	0.57	NO
2,4,6-TRICHLOROPHENOL	0.416 - 0.76	0 / 23	--	--	10	-- / --	0.08	NO
2,4-DICHLOROPHENOL	0.416 - 0.76	0 / 23	--	--	NSV	-- / --	NSV	NO
2,4-DIMETHYLPHENOL	0.416 - 0.76	0 / 23	--	--	NSV	-- / --	NSV	NO
2,4-DINITROPHENOL	1.25 - 2.28	0 / 23	--	--	20	-- / --	0.11	NO
2,4-DINITROTOLUENE	0.416 - 0.76	0 / 23	--	--	NSV	-- / --	NSV	NO
2,6-DINITROTOLUENE	0.416 - 0.76	0 / 23	--	--	NSV	-- / --	NSV	NO
2-CHLORONAPHTHALENE	0.416 - 0.76	0 / 23	--	--	NSV	-- / --	NSV	NO

TABLE L-27
Step 2 Screening Statistics and COPC Selection - SWMU 6 - Surface Soil
SWMU 6 Former NASD, Vieques Island, Puerto Rico

Chemical	Detection Limit Range for Non-detects	Frequency of Detection	Maximum Concentration Detected	Sample ID of Maximum Concentration	Screening Value	Frequency of Exceedance	Maximum Hazard Quotient[1]	COPC?
2-CHLOROPHENOL	0.416 - 0.76	0 / 23	--	--	NSV	-- / --	NSV	NO
2-METHYLNAPHTHALENE	0.416 - 0.76	1 / 23	0.311	NDA111	NSV	-- / --	NSV	**YES**
2-METHYLPHENOL (o-CRESOL)	0.416 - 0.76	0 / 23	--	--	NSV	-- / --	NSV	NO
2-NITROANILINE	1.25 - 2.28	0 / 23	--	--	NSV	-- / --	NSV	NO
2-NITROPHENOL	0.416 - 0.76	0 / 23	--	--	NSV	-- / --	NSV	NO
3,3'-DICHLOROBENZIDINE	0.845 - 1.52	0 / 23	--	--	NSV	-- / --	NSV	NO
3-NITROANILINE	1.25 - 2.28	0 / 23	--	--	NSV	-- / --	NSV	NO
4,6-DINITRO-2-METHYLPHENOL	1.25 - 2.28	0 / 23	--	--	NSV	-- / --	NSV	NO
4-BROMOPHENYL PHENYL ETHER	0.416 - 0.76	0 / 23	--	--	NSV	-- / --	NSV	NO
4-CHLORO-3-METHYLPHENOL	0.416 - 0.76	0 / 23	--	--	NSV	-- / --	NSV	NO
4-CHLOROANILINE	0.416 - 0.76	0 / 23	--	--	NSV	-- / --	NSV	NO
4-CHLOROPHENYL PHENYL ETHER	0.416 - 0.76	0 / 23	--	--	NSV	-- / --	NSV	NO
4-METHYLPHENOL (p-CRESOL)	0.416 - 0.597	0 / 15	--	--	NSV	-- / --	NSV	NO
4-NITROANILINE	1.25 - 2.28	0 / 23	--	--	NSV	-- / --	NSV	NO
4-NITROPHENOL	1.25 - 2.28	0 / 23	--	--	7	-- / --	0.33	NO
ACENAPHTHENE	0.416 - 0.76	1 / 23	0.684	NDA111	20	0 / 23	0.03	NO
ACENAPHTHYLENE	0.43 - 0.76	1 / 23	0.0282	NDW06SS13-R01	NSV	-- / --	NSV	**YES**
ACETOPHENONE	0.416 - 0.597	0 / 15	--	--	NSV	-- / --	NSV	NO
ANTHRACENE	0.43 - 0.76	2 / 23	0.902	NDA111	0.1	1 / 23	9.02	**YES**
ATRAZINE	0.416 - 0.597	0 / 15	--	--	0.00005	-- / --	11940	--[3]
Benzaldehyde	0.416 - 0.597	0 / 15	--	--	NSV	-- / --	NSV	NO
BENZO(a)ANTHRACENE	0.43 - 0.627	5 / 23	1.87	NDA111	NSV	-- / --	NSV	NO
BENZO(a)PYRENE	0.43 - 0.627	7 / 23	1.51	NDA111	0.1	4 / 23	15	**YES**
BENZO(b)FLUORANTHENE	0.43 - 0.627	8 / 23	1.8	NDA111	NSV	-- / --	NSV	**YES**
BENZO(g,h,i)PERYLENE	0.43 - 0.627	7 / 23	1.16	NDW06SS13-R01	1	1 / 23	1.16	**YES**
BENZO(k)FLUORANTHENE	0.43 - 0.627	7 / 23	1.23	NDA111	NSV	-- / --	NSV	**YES**
BENZYL BUTYL PHTHALATE	0.416 - 0.76	0 / 23	--	--	NSV	-- / --	NSV	NO
BIPHENYL (DIPHENYL)	0.416 - 0.597	0 / 15	--	--	NSV	-- / --	NSV	NO
bis(2-CHLOROETHOXY) METHANE	0.416 - 0.76	0 / 23	--	--	NSV	-- / --	NSV	NO
bis(2-CHLOROETHYL) ETHER (2-Cl	0.416 - 0.76	0 / 23	--	--	NSV	-- / --	NSV	NO
bis(2-CHLOROISOPROPYL) ETHER	0.416 - 0.76	0 / 23	--	--	NSV	-- / --	NSV	NO
bis(2-ETHYLHEXYL) PHTHALATE	0.416 - 0.76	2 / 23	1.4	NDA101	NSV	-- / --	NSV	**YES**
CAPROLACTAM	0.416 - 0.597	0 / 15	--	--	NSV	-- / --	NSV	NO

TABLE L-27
Step 2 Screening Statistics and COPC Selection - SWMU 6 - Surface Soil
SWMU 6 Former NASD, Vieques Island, Puerto Rico

Chemical	Detection Limit Range for Non-detects	Frequency of Detection	Maximum Concentration Detected	Sample ID of Maximum Concentration	Screening Value	Frequency of Exceedance	Maximum Hazard Quotient[1]	COPC?
CARBAZOLE	0.416 - 0.76	1 / 23	0.431	NDA111	NSV	-- / --	NSV	**YES**
CHRYSENE	0.43 - 0.627	8 / 23	2	NDA111	NSV	-- / --	NSV	**YES**
CRESOLS, m & p	0.503 - 0.76	0 / 8	--	--	NSV	-- / --	NSV	NO
DI-n-BUTYL PHTHALATE	0.416 - 0.76	0 / 23	--	--	200	-- / --	0.004	NO
DI-n-OCTYLPHTHALATE	0.416 - 0.76	0 / 23	--	--	NSV	-- / --	NSV	NO
DIBENZ(a,h)ANTHRACENE	0.43 - 0.76	3 / 23	0.345	NDW06SS13-R01	NSV	-- / --	NSV	**YES**
DIBENZOFURAN	0.416 - 0.76	1 / 23	0.784	NDA111	NSV	-- / --	NSV	**YES**
DIETHYL PHTHALATE	0.416 - 0.76	0 / 23	--	--	100	-- / --	0.01	NO
DIMETHYL PHTHALATE	0.416 - 0.76	0 / 23	--	--	200	-- / --	0.004	NO
FLUORANTHENE	0.43 - 0.627	7 / 23	4.06	NDA111	0.1	4 / 23	41	**YES**
FLUORENE	0.416 - 0.76	1 / 23	0.44	NDA111	30	0 / 23	0.01	NO
HEXACHLOROBENZENE	0.416 - 0.76	0 / 23	--	--	1000	-- / --	0.001	NO
HEXACHLOROBUTADIENE	0.416 - 0.76	0 / 23	--	--	NSV	-- / --	NSV	NO
HEXACHLOROCYCLOPENTADIENE	0.416 - 0.76	0 / 23	--	--	10	-- / --	0.08	NO
HEXACHLOROETHANE	0.416 - 0.76	0 / 23	--	--	NSV	-- / --	NSV	NO
INDENO(1,2,3-c,d)PYRENE	0.43 - 0.627	6 / 23	1.13	NDW06SS13-R01	NSV	-- / --	NSV	**YES**
ISOPHORONE	0.416 - 0.76	0 / 23	--	--	NSV	-- / --	NSV	NO
N-NITROSODI-n-PROPYLAMINE	0.416 - 0.76	0 / 23	--	--	NSV	-- / --	NSV	NO
N-NITROSODIPHENYLAMINE	0.416 - 0.76	0 / 23	--	--	20	-- / --	0.04	NO
NAPHTHALENE	0.416 - 0.76	1 / 23	0.621	NDA111	0.1	1 / 23	6.21	**YES**
NITROBENZENE	0.416 - 0.76	0 / 23	--	--	40	-- / --	0.02	NO
PENTACHLOROPHENOL	1.25 - 2.28	0 / 23	--	--	3	-- / --	0.76	NO
PHENANTHRENE	0.43 - 0.76	4 / 23	4.86	NDA111	0.1	2 / 23	49	**YES**
PHENOL	0.416 - 0.76	0 / 23	--	--	30	-- / --	0.03	NO
PYRENE	0.43 - 0.627	9 / 23	2.9	NDA111	0.1	4 / 23	29	**YES**
Total PAHs	0.43 - 0.627	9 / 23	25.83	NDA111	1	9 / 23	25.8	**YES**
Volatile Organic Compounds (MG/KG)								
1,1,1-TRICHLOROETHANE	0.01 - 0.0221	0 / 23	--	--	NSV	-- / --	NSV	NO
1,1,2,2-TETRACHLOROETHANE	0.01 - 0.0221	0 / 23	--	--	NSV	-- / --	NSV	NO
1,1,2-TRICHLORO-1,2,2-TRIFLUORO	0.0107 - 0.0221	0 / 15	--	--	NSV	-- / --	NSV	NO
1,1,2-TRICHLOROETHANE	0.01 - 0.0221	0 / 23	--	--	NSV	-- / --	NSV	NO
1,1-DICHLOROETHANE	0.01 - 0.0221	0 / 23	--	--	NSV	-- / --	NSV	NO
1,1-DICHLOROETHENE	0.01 - 0.0221	0 / 23	--	--	NSV	-- / --	NSV	NO
1,2,4-TRICHLOROBENZENE	0.0107 - 0.0221	0 / 15	--	--	20	-- / --	0.001	NO

TABLE L-27
Step 2 Screening Statistics and COPC Selection - SWMU 6 - Surface Soil
SWMU 6 Former NASD, Vieques Island, Puerto Rico

Chemical	Detection Limit Range for Non-detects	Frequency of Detection	Maximum Concentration Detected	Sample ID of Maximum Concentration	Screening Value	Frequency of Exceedance	Maximum Hazard Quotient[1]	COPC?
1,2-DIBROMO-3-CHLOROPROPANE	0.0107 - 0.0221	0 / 15	--	--	NSV	-- / --	NSV	NO
1,2-DIBROMOETHANE (ETHYLENE	0.0107 - 0.0221	0 / 15	--	--	NSV	-- / --	NSV	NO
1,2-DICHLOROBENZENE	0.0107 - 0.0221	0 / 15	--	--	NSV	-- / --	NSV	NO
1,2-DICHLOROETHANE	0.01 - 0.0221	0 / 23	--	--	4	-- / --	0.01	NO
1,2-DICHLOROPROPANE	0.01 - 0.0221	0 / 23	--	--	700	-- / --	0.00003	NO
1,3-DICHLOROBENZENE	0.0107 - 0.0221	0 / 15	--	--	NSV	-- / --	NSV	NO
1,4-DICHLOROBENZENE	0.0107 - 0.0221	0 / 15	--	--	20	-- / --	0.001	NO
2-HEXANONE	0.01 - 0.0221	0 / 23	--	--	NSV	-- / --	NSV	NO
ACETONE	0.0107 - 0.0221	1 / 15	1.33	NDW06SS14-R01	NSV	-- / --	NSV	**YES**
BENZENE	0.01 - 0.0221	0 / 23	--	--	0.05	-- / --	0.44	NO
BROMODICHLOROMETHANE	0.01 - 0.0221	0 / 23	--	--	NSV	-- / --	NSV	NO
BROMOFORM	0.01 - 0.0221	0 / 23	--	--	NSV	-- / --	NSV	NO
BROMOMETHANE	0.01 - 0.0221	0 / 23	--	--	NSV	-- / --	NSV	NO
CARBON DISULFIDE	0.01 - 0.0206	5 / 23	0.002	NDA101, NDA103	NSV	-- / --	NSV	**YES**
CARBON TETRACHLORIDE	0.01 - 0.0221	0 / 23	--	--	1000	-- / --	0.00002	NO
CHLOROBENZENE	0.01 - 0.0221	0 / 23	--	--	40	-- / --	0.001	NO
CHLOROETHANE	0.01 - 0.0221	0 / 23	--	--	NSV	-- / --	NSV	NO
CHLOROFORM	0.01 - 0.0221	0 / 23	--	--	0.001	-- / --	22	--[3]
CHLOROMETHANE	0.01 - 0.0221	0 / 23	--	--	NSV	-- / --	NSV	NO
cis-1,2-DICHLOROETHYLENE	0.0107 - 0.0221	0 / 15	--	--	NSV	-- / --	NSV	NO
cis-1,3-DICHLOROPROPENE	0.01 - 0.0221	0 / 23	--	--	NSV	-- / --	NSV	NO
CYCLOHEXANE	0.0107 - 0.0221	0 / 15	--	--	0.1	-- / --	0.22	NO
DIBROMOCHLOROMETHANE	0.01 - 0.0221	0 / 23	--	--	NSV	-- / --	NSV	NO
DICHLORODIFLUOROMETHANE	0.0107 - 0.0221	0 / 15	--	--	NSV	-- / --	NSV	NO
ETHYLBENZENE	0.01 - 0.0221	1 / 23	0.001	NDA117	0.05	0 / 23	0.02	NO
ISOPROPYLBENZENE (CUMENE)	0.0107 - 0.0221	0 / 15	--	--	NSV	-- / --	NSV	NO
M,P-XYLENE (SUM OF ISOMERS)	0.01 - 0.013	2 / 8	0.004	NDA117	NSV	-- / --	NSV	**YES**
METHYL ACETATE	0.0107 - 0.0221	0 / 15	--	--	NSV	-- / --	NSV	NO
METHYL ETHYL KETONE (2-BUTAN	0.0107 - 0.0221	1 / 16	0.003	NDA101	NSV	-- / --	NSV	**YES**
METHYL ISOBUTYL KETONE (4-ME	0.01 - 0.0221	0 / 23	--	--	NSV	-- / --	NSV	NO
METHYLCYCLOHEXANE	0.0107 - 0.0221	0 / 15	--	--	NSV	-- / --	NSV	NO
METHYLENE CHLORIDE	0.01 - 0.0221	3 / 23	0.0015	NDW06SS16-R01	NSV	-- / --	NSV	**YES**
O-XYLENE (1,2-DIMETHYLBENZENE	0.01 - 0.014	1 / 8	0.002	NDA117	NSV	-- / --	NSV	**YES**

TABLE L-27
Step 2 Screening Statistics and COPC Selection - SWMU 6 - Surface Soil
SWMU 6 Former NASD, Vieques Island, Puerto Rico

Chemical	Detection Limit Range for Non-detects	Frequency of Detection	Maximum Concentration Detected	Sample ID of Maximum Concentration	Screening Value	Frequency of Exceedance	Maximum Hazard Quotient[1]	COPC?
STYRENE	0.01 - 0.0221	0 / 23	--	--	300	-- / --	0.0001	NO
tert-BUTYL METHYL ETHER	0.0107 - 0.0221	0 / 15	--	--	NSV	-- / --	NSV	NO
TETRACHLOROETHYLENE(PCE)	0.01 - 0.0221	0 / 23	--	--	0.01	-- / --	2.21	--[3]
TOLUENE	0.01 - 0.0221	1 / 23	0.0008	NDA117	200	0 / 23	0.000004	NO
trans-1,2-DICHLOROETHENE	0.0107 - 0.0221	0 / 15	--	--	NSV	-- / --	NSV	NO
trans-1,3-DICHLOROPROPENE	0.01 - 0.0221	0 / 23	--	--	NSV	-- / --	NSV	NO
TRICHLOROETHYLENE (TCE)	0.01 - 0.0221	0 / 23	--	--	0.001	-- / --	22	--[3]
TRICHLOROFLUOROMETHANE	0.0107 - 0.0221	0 / 15	--	--	NSV	-- / --	NSV	NO
VINYL CHLORIDE	0.01 - 0.0221	0 / 23	--	--	0.1	-- / --	0.22	NO
XYLENES, TOTAL	0.01 - 0.0221	2 / 23	0.006	NDA117	0.05	0 / 23	0.12	NO
Explosives (MG/KG)								
1,3,5-TRINITROBENZENE	0.159 - 0.342	0 / 23	--	--	NSV	-- / --	NSV	NO
1,3-DINITROBENZENE	0.159 - 0.342	0 / 23	--	--	NSV	-- / --	NSV	NO
2,4,6-TRINITROTOLUENE	0.159 - 0.342	0 / 23	--	--	NSV	-- / --	NSV	NO
2,4-DINITROTOLUENE	0.159 - 0.342	0 / 23	--	--	NSV	-- / --	NSV	NO
2,6-DINITROTOLUENE	0.159 - 0.342	0 / 23	--	--	NSV	-- / --	NSV	NO
2-NITROTOLUENE	0.159 - 0.342	0 / 23	--	--	NSV	-- / --	NSV	NO
3-NITROTOLUENE	0.159 - 0.342	0 / 23	--	--	NSV	-- / --	NSV	NO
4-NITROTOLUENE	0.159 - 0.342	0 / 23	--	--	NSV	-- / --	NSV	NO
HEXAHYDRO-1,3,5-TRINITRO-1,3,5,	0.159 - 0.342	0 / 23	--	--	NSV	-- / --	NSV	NO
NITROBENZENE	0.159 - 0.342	0 / 23	--	--	40	-- / --	0.01	NO
OCTAHYDRO-1,3,5,7-TETRANITRO-	0.159 - 0.342	0 / 23	--	--	NSV	-- / --	NSV	NO
Perchlorate	0.126 - 0.191	0 / 15	--	--	NSV	-- / --	NSV	NO
TETRYL	0.159 - 0.342	0 / 23	--	--	NSV	-- / --	NSV	NO

NSV - No screening value
1 - Maximum HQ based on maximum concentration detected unless frequency of detection is zero, in which case it is based on maximum reporting limit - indicated by shaded cells.
2 - Macronutrient - Not considered to be a COPC.
3 - Chemical not detected, however detection limit exceeded screening value. Chemical not retained as COPC - see Section 7.5 (Uncertainties)

TABLE L-28
Step 2 Screening Statistics and COPC Selection - SWMU 6 - Surface Water
SWMU 6 Former NASD, Vieques Island, Puerto Rico

Chemical	Detection Limit Range for Non-detects	Frequency of Detection	Maximum Concentration Detected	Sample ID of Maximum Concentration	Screening Value	Frequency of Exceedance	Maximum Hazard Quotient[1]	COPC?
Inorganics (UG/L)								
ALUMINUM	700 - 700	12 / 14	2970	NDA301	NSV	-- / --	NSV	**YES**
ALUMINUM, DISSOLVED	700 - 700	0 / 7	--	--	NSV	-- / --	NSV	NO
ANTIMONY	1.4 - 50	0 / 14	--	--	4300	-- / --	0.01	NO
ANTIMONY, DISSOLVED	50 - 50	0 / 7	--	--	4300	-- / --	0.01	NO
ARSENIC	3.4 - 40.8	3 / 14	5.3	NDA300	1.4	3 / 14	3.79	**YES**
ARSENIC, DISSOLVED	40.8 - 40.8	0 / 7	--	--	1.4	-- / --	29.14	--[3]
BARIUM	9.82 - 9.82	13 / 14	15.1	NDA301	NSV	-- / --	NSV	**YES**
BARIUM, DISSOLVED	9.82 - 9.82	0 / 7	--	--	NSV	-- / --	NSV	NO
BERYLLIUM	0.3 - 1.89	0 / 14	--	--	NSV	-- / --	NSV	NO
BERYLLIUM, DISSOLVED	1.89 - 1.89	0 / 7	--	--	NSV	-- / --	NSV	NO
CADMIUM	7.12 - 7.12	7 / 14	2	A039, NDA037, NDA0	9.3	0 / 14	0.22	NO
CADMIUM, DISSOLVED	7.12 - 7.12	0 / 7	--	--	9.3	-- / --	0.77	NO
CALCIUM [2]	-- - --	14 / 14	487000	NDA301	NSV	-- / --	NSV	NO
CALCIUM, DISSOLVED [2]	-- - --	7 / 7	419000	NDW06SW02-R01	NSV	-- / --	NSV	NO
CHROMIUM, DISSOLVED	11.4 - 11.4	0 / 7	--	--	50	-- / --	0.23	NO
CHROMIUM, TOTAL	0.5 - 11.4	5 / 14	1.1	NDA035, NDA037	50.4	0 / 14	0.02	NO
COBALT	0.5 - 11.4	2 / 14	1.1	NDA037	NSV	-- / --	NSV	**YES**
COBALT, DISSOLVED	11.4 - 11.4	0 / 7	--	--	NSV	-- / --	NSV	NO
COPPER	1.9 - 23.4	7 / 14	38.9	NDW06SW07-R01	3.7	4 / 14	10.51	**YES**
COPPER, DISSOLVED	23.4 - 23.4	0 / 7	--	--	3.1	-- / --	7.55	--[3]
IRON	334 - 334	7 / 14	1410	NDA301	NSV	-- / --	NSV	**YES**
IRON, DISSOLVED	334 - 334	0 / 7	--	--	NSV	-- / --	NSV	NO
LEAD	1.1 - 35.2	4 / 14	14.7	NDA300	8.1	1 / 14	1.81	**YES**
LEAD, DISSOLVED	35.2 - 35.2	0 / 7	--	--	8.1	-- / --	4.35	--[3]
MAGNESIUM [2]	-- - --	14 / 14	1540000	NDA301	NSV	-- / --	NSV	NO
MAGNESIUM, DISSOLVED [2]	-- - --	7 / 7	1270000	NDW06SW02-R01	NSV	-- / --	NSV	NO
MANGANESE	3.34 - 3.34	13 / 14	42	NDW06SW07-R01	NSV	-- / --	NSV	**YES**
MANGANESE, DISSOLVED	3.34 - 3.34	4 / 7	24.5	NDW06SW08-R01	NSV	-- / --	NSV	**YES**
MERCURY	0.0162 - 0.0162	7 / 8	1.6	NDA037	0.051	1 / 8	31.37	**YES**
MERCURY, DISSOLVED	0.0162 - 0.0162	6 / 7	0.0452	NDW06SW05-R01	0.051	0 / 7	0.89	NO
NICKEL	0.8 - 19.9	2 / 14	1.1	NDA036	8.2	0 / 14	0.13	NO
NICKEL, DISSOLVED	19.9 - 19.9	1 / 7	52	NDW06SW02-R01	8.2	1 / 7	6.34	**YES**

TABLE L-28
Step 2 Screening Statistics and COPC Selection - SWMU 6 - Surface Water
SWMU 6 Former NASD, Vieques Island, Puerto Rico

Chemical	Detection Limit Range for Non-detects	Frequency of Detection	Maximum Concentration Detected	Sample ID of Maximum Concentration	Screening Value	Frequency of Exceedance	Maximum Hazard Quotient[1]	COPC?
POTASSIUM [2]	26.6 - 26.6	8 / 14	709000	NDW06SW08-R01	NSV	-- / --	NSV	NO
POTASSIUM, DISSOLVED [2]	-- - --	7 / 7	667000	NDW06SW02-R01	NSV	-- / --	NSV	NO
SELENIUM	42 - 42	7 / 14	6.4	NDA037	71	0 / 14	0.09	NO
SELENIUM, DISSOLVED	42 - 42	0 / 7	--	--	71	-- / --	0.59	NO
SILVER	2.5 - 9.44	1 / 14	7.1	NDA040	1.9	1 / 14	3.74	**YES**
SILVER, DISSOLVED	9.44 - 9.44	0 / 7	--	--	1.9	-- / --	4.97	--[3]
SODIUM [2]	-- - --	14 / 14	12100000	NDA301	NSV	-- / --	NSV	NO
SODIUM, DISSOLVED [2]	-- - --	7 / 7	10400000	NDW06SW02-R01	NSV	-- / --	NSV	NO
THALLIUM	2.7 - 50.8	1 / 14	4.9	NDA036	NSV	-- / --	NSV	**YES**
THALLIUM, DISSOLVED	50.8 - 50.8	0 / 7	--	--	NSV	-- / --	NSV	NO
VANADIUM	8.94 - 8.94	7 / 14	5.8	NDA301	NSV	-- / --	NSV	**YES**
VANADIUM, DISSOLVED	8.94 - 8.94	0 / 7	--	--	NSV	-- / --	NSV	NO
ZINC	8.18 - 12.5	0 / 14	--	--	81	-- / --	0.15	NO
ZINC, DISSOLVED	8.18 - 8.18	0 / 7	--	--	81	-- / --	0.10	NO
Pesticides/Polychlorinated Biphenyls (UG/L)								
PCB-1016 (AROCHLOR 1016)	0.99 - 1.1	0 / 14	--	--	0.03	-- / --	37	--[3]
PCB-1221 (AROCHLOR 1221)	0.2 - 2.3	0 / 14	--	--	0.03	-- / --	77	--[3]
PCB-1232 (AROCHLOR 1232)	0.4 - 1.1	0 / 14	--	--	0.03	-- / --	37	--[3]
PCB-1242 (AROCHLOR 1242)	0.2 - 1.1	0 / 14	--	--	0.03	-- / --	37	--[3]
PCB-1248 (AROCHLOR 1248)	0.2 - 1.1	0 / 14	--	--	0.03	-- / --	37	--[3]
PCB-1254 (AROCHLOR 1254)	0.2 - 1.1	0 / 14	--	--	0.03	-- / --	37	--[3]
PCB-1260 (AROCHLOR 1260)	0.2 - 1.1	0 / 14	--	--	0.03	-- / --	37	--[3]
ALDRIN	0.0099 - 0.06	0 / 14	--	--	0.0014	-- / --	43	--[3]
ALPHA BHC (ALPHA HEXACHLOROCYCL	0.0099 - 0.06	0 / 14	--	--	NSV	-- / --	NSV	NO
ALPHA ENDOSULFAN	0.0099 - 0.06	0 / 14	--	--	0.056	-- / --	1.07	--[3]
ALPHA-CHLORDANE	0.0099 - 0.06	0 / 14	--	--	NSV	-- / --	NSV	NO
BETA BHC (BETA HEXACHLOROCYCLOH	0.0099 - 0.06	0 / 14	--	--	NSV	-- / --	NSV	NO
BETA ENDOSULFAN	0.02 - 0.11	0 / 14	--	--	0.056	-- / --	1.96	--[3]
DELTA BHC (DELTA HEXACHLOROCYCL	0.0099 - 0.06	0 / 14	--	--	NSV	-- / --	NSV	NO
DIELDRIN	0.02 - 0.11	0 / 14	--	--	0.0014	-- / --	78.57	--[3]
ENDOSULFAN SULFATE	0.02 - 0.11	0 / 14	--	--	NSV	-- / --	NSV	NO
ENDRIN	0.02 - 0.11	0 / 14	--	--	0.0023	-- / --	47.83	--[3]

TABLE L-28
Step 2 Screening Statistics and COPC Selection - SWMU 6 - Surface Water
SWMU 6 Former NASD, Vieques Island, Puerto Rico

Chemical	Detection Limit Range for Non-detects	Frequency of Detection	Maximum Concentration Detected	Sample ID of Maximum Concentration	Screening Value	Frequency of Exceedance	Maximum Hazard Quotient[1]	COPC?
ENDRIN ALDEHYDE	0.02 - 0.11	0 / 14	--	--	NSV	-- / --	NSV	NO
ENDRIN KETONE	0.02 - 0.11	0 / 14	--	--	NSV	-- / --	NSV	NO
GAMMA BHC (LINDANE)	0.0099 - 0.06	0 / 14	--	--	0.16	-- / --	0.38	NO
GAMMA-CHLORDANE	0.0099 - 0.06	0 / 14	--	--	NSV	-- / --	NSV	NO
HEPTACHLOR	0.0099 - 0.06	0 / 14	--	--	0.0021	-- / --	28.57	--[3]
HEPTACHLOR EPOXIDE	0.0099 - 0.06	0 / 14	--	--	0.0036	-- / --	16.67	--[3]
METHOXYCHLOR	0.099 - 0.57	0 / 14	--	--	0.03	-- / --	19.00	--[3]
p,p'-DDD	0.02 - 0.11	0 / 14	--	--	NSV	-- / --	NSV	NO
p,p'-DDE	0.02 - 0.11	0 / 14	--	--	NSV	-- / --	NSV	NO
p,p'-DDT	0.02 - 0.11	0 / 14	--	--	0.001	-- / --	110.00	--[3]
TOXAPHENE	0.05 - 5.7	0 / 14	--	--	0.0002	-- / --	28500.00	--[3]
Semi-volatile Organic Compounds (UG/L)								
1,2,4,5-TETRACHLOROBENZENE	5 - 5.3	0 / 6	--	--	NSV	-- / --	NSV	NO
1,2,4-TRICHLOROBENZENE	10 - 11	0 / 7	--	--	260	-- / --	0.04	NO
1,2-DICHLOROBENZENE	10 - 11	0 / 7	--	--	2700	-- / --	0.004	NO
1,3-DICHLOROBENZENE	10 - 11	0 / 7	--	--	400	-- / --	0.03	NO
1,4-DICHLOROBENZENE	10 - 11	0 / 7	--	--	400	-- / --	0.03	NO
2,4,5-TRICHLOROPHENOL	20 - 54	0 / 14	--	--	NSV	-- / --	NSV	NO
2,4,6-TRICHLOROPHENOL	5 - 11	0 / 14	--	--	21	-- / --	0.52	NO
2,4-DICHLOROPHENOL	5 - 11	0 / 14	--	--	93	-- / --	0.12	NO
2,4-DIMETHYLPHENOL	5 - 11	0 / 14	--	--	540	-- / --	0.02	NO
2,4-DINITROPHENOL	20 - 54	0 / 14	--	--	70	-- / --	0.77	NO
2,4-DINITROTOLUENE	5 - 11	0 / 14	--	--	0.11	-- / --	100.00	--[3]
2,6-DINITROTOLUENE	5 - 11	0 / 14	--	--	NSV	-- / --	NSV	NO
2-CHLORONAPHTHALENE	5 - 11	0 / 14	--	--	1700	-- / --	0.01	NO
2-CHLOROPHENOL	5 - 11	0 / 14	--	--	120	-- / --	0.09	NO
2-METHYLNAPHTHALENE	5 - 11	0 / 14	--	--	NSV	-- / --	NSV	NO
2-METHYLPHENOL (o-CRESOL)	5 - 11	0 / 14	--	--	NSV	-- / --	NSV	NO
2-NITROANILINE	20 - 54	0 / 14	--	--	NSV	-- / --	NSV	NO
2-NITROPHENOL	5 - 11	0 / 14	--	--	NSV	-- / --	NSV	NO
3,3'-DICHLOROBENZIDINE	5 - 22	0 / 14	--	--	0.4	-- / --	55	--[3]
3-NITROANILINE	20 - 54	0 / 14	--	--	NSV	-- / --	NSV	NO
4,6-DINITRO-2-METHYLPHENOL	20 - 54	0 / 14	--	--	NSV	-- / --	NSV	NO

TABLE L-28
Step 2 Screening Statistics and COPC Selection - SWMU 6 - Surface Water
SWMU 6 Former NASD, Vieques Island, Puerto Rico

Chemical	Detection Limit Range for Non-detects	Frequency of Detection	Maximum Concentration Detected	Sample ID of Maximum Concentration	Screening Value	Frequency of Exceedance	Maximum Hazard Quotient[1]	COPC?
4-BROMOPHENYL PHENYL ETHER	5 - 11	0 / 14	--	--	NSV	-- / --	NSV	NO
4-CHLORO-3-METHYLPHENOL	5 - 11	0 / 14	--	--	NSV	-- / --	NSV	NO
4-CHLOROANILINE	5 - 11	0 / 14	--	--	NSV	-- / --	NSV	NO
4-CHLOROPHENYL PHENYL ETHER	5 - 11	0 / 14	--	--	NSV	-- / --	NSV	NO
4-METHYLPHENOL (p-CRESOL)	5 - 10.3	0 / 7	--	--	NSV	-- / --	NSV	NO
4-NITROANILINE	20 - 54	0 / 14	--	--	NSV	-- / --	NSV	NO
4-NITROPHENOL	20 - 54	0 / 14	--	--	NSV	-- / --	NSV	NO
ACENAPHTHENE	5 - 11	0 / 14	--	--	1200	-- / --	0.01	NO
ACENAPHTHYLENE	5 - 11	0 / 14	--	--	NSV	-- / --	NSV	NO
ACETOPHENONE	5 - 10.3	0 / 7	--	--	NSV	-- / --	NSV	NO
ANTHRACENE	5 - 11	0 / 14	--	--	9600	-- / --	0.001	NO
ATRAZINE	5 - 10.3	0 / 7	--	--	NSV	-- / --	NSV	NO
Benzaldehyde	5 - 10.3	0 / 7	--	--	NSV	-- / --	NSV	NO
BENZO(a)ANTHRACENE	5 - 11	0 / 14	--	--	0.044	-- / --	250	--[3]
BENZO(a)PYRENE	5 - 11	0 / 14	--	--	0.044	-- / --	250	--[3]
BENZO(b)FLUORANTHENE	5 - 11	0 / 14	--	--	0.044	-- / --	250	--[3]
BENZO(g,h,i)PERYLENE	5 - 11	0 / 14	--	--	NSV	-- / --	NSV	NO
BENZO(k)FLUORANTHENE	5 - 11	0 / 14	--	--	0.044	-- / --	250	--[3]
BENZYL BUTYL PHTHALATE	5 - 11	0 / 14	--	--	3000	-- / --	0.004	NO
BIPHENYL (DIPHENYL)	5 - 10.3	0 / 7	--	--	NSV	-- / --	NSV	NO
bis(2-CHLOROETHOXY) METHANE	5 - 11	0 / 14	--	--	NSV	-- / --	NSV	NO
bis(2-CHLOROETHYL) ETHER (2-CHLOR	5 - 11	0 / 14	--	--	0.31	-- / --	35.48	--[3]
bis(2-CHLOROISOPROPYL) ETHER	5 - 11	0 / 14	--	--	NSV	-- / --	NSV	NO
bis(2-ETHYLHEXYL) PHTHALATE	10 - 20.6	0 / 14	--	--	18	-- / --	1.14	--[3]
CARBAZOLE	10 - 20.6	0 / 14	--	--	NSV	-- / --	NSV	NO
CHRYSENE	5 - 11	0 / 14	--	--	0.044	-- / --	250	--[3]
CRESOLS, m & p	10 - 11	0 / 7	--	--	NSV	-- / --	NSV	NO
DI-n-BUTYL PHTHALATE	5 - 11	0 / 14	--	--	2700	-- / --	0.004	NO
DI-n-OCTYLPHTHALATE	5 - 11	1 / 14	6	NDW06SW09-R01	NSV	-- / --	NSV	**YES**
DIBENZ(a,h)ANTHRACENE	5 - 11	0 / 14	--	--	0.044	-- / --	250	--[3]
DIBENZOFURAN	5 - 11	0 / 14	--	--	1000	-- / --	0.01	NO
DIETHYL PHTHALATE	5 - 11	3 / 14	0.6	NDA035	23000	0 / 14	0.00003	NO
DIMETHYL PHTHALATE	5 - 11	0 / 14	--	--	313000	-- / --	0.00004	NO

TABLE L-28
Step 2 Screening Statistics and COPC Selection - SWMU 6 - Surface Water
SWMU 6 Former NASD, Vieques Island, Puerto Rico

Chemical	Detection Limit Range for Non-detects	Frequency of Detection	Maximum Concentration Detected	Sample ID of Maximum Concentration	Screening Value	Frequency of Exceedance	Maximum Hazard Quotient[1]	COPC?
FLUORANTHENE	5 - 11	0 / 14	--	--	300	-- / --	0.04	NO
FLUORENE	5 - 11	0 / 14	--	--	1300	-- / --	0.01	NO
HEXACHLOROBENZENE	5 - 11	0 / 14	--	--	0.0075	-- / --	1466.67	--[3]
HEXACHLOROBUTADIENE	5 - 11	0 / 14	--	--	4.4	-- / --	2.50	--[3]
HEXACHLOROCYCLOPENTADIENE	5 - 11	0 / 14	--	--	240	-- / --	0.05	NO
HEXACHLOROETHANE	5 - 11	0 / 14	--	--	19	-- / --	0.58	NO
INDENO(1,2,3-c,d)PYRENE	5 - 11	0 / 14	--	--	0.044	-- / --	250.00	--[3]
ISOPHORONE	5 - 11	0 / 14	--	--	360	-- / --	0.03	NO
N-NITROSODI-n-PROPYLAMINE	5 - 11	0 / 14	--	--	0.05	-- / --	220.00	--[3]
N-NITROSODIPHENYLAMINE	5 - 11	0 / 14	--	--	50	-- / --	0.22	NO
NAPHTHALENE	5 - 11	0 / 14	--	--	NSV	-- / --	NSV	NO
NITROBENZENE	5 - 11	0 / 14	--	--	17	-- / --	0.65	NO
PENTACHLOROPHENOL	20 - 54	0 / 14	--	--	7.9	-- / --	6.84	--[3]
PHENANTHRENE	5 - 11	0 / 14	--	--	NSV	-- / --	NSV	NO
PHENOL	5 - 11	0 / 14	--	--	21000	-- / --	0.001	NO
PYRENE	5 - 11	0 / 14	--	--	960	-- / --	0.01	NO
Volatile Organic Compounds (UG/L)								
1,1,1-TRICHLOROETHANE	0.5 - 10	0 / 14	--	--	200	-- / --	0.05	NO
1,1,2,2-TETRACHLOROETHANE	0.5 - 10	0 / 14	--	--	1.7	-- / --	5.88	--[3]
1,1,2-TRICHLORO-1,2,2-TRIFLUOROETH	0.5 - 0.5	0 / 7	--	--	NSV	-- / --	NSV	NO
1,1,2-TRICHLOROETHANE	0.5 - 10	0 / 14	--	--	6	-- / --	1.67	--[3]
1,1-DICHLOROETHANE	0.5 - 10	0 / 14	--	--	NSV	-- / --	NSV	NO
1,1-DICHLOROETHENE	0.5 - 10	0 / 14	--	--	0.57	-- / --	17.54	--[3]
1,2,4-TRICHLOROBENZENE	0.5 - 0.5	0 / 7	--	--	260	-- / --	0.002	NO
1,2-DIBROMO-3-CHLOROPROPANE	2 - 2	0 / 7	--	--	NSV	-- / --	NSV	NO
1,2-DIBROMOETHANE (ETHYLENE DIBR	0.5 - 0.5	0 / 7	--	--	NSV	-- / --	NSV	NO
1,2-DICHLOROBENZENE	0.5 - 0.5	0 / 7	--	--	2700	-- / --	0.0002	NO
1,2-DICHLOROETHANE	0.5 - 10	0 / 14	--	--	3.8	-- / --	2.63	--[3]
1,2-DICHLOROPROPANE	0.5 - 10	0 / 14	--	--	5.2	-- / --	1.92	--[3]
1,3-DICHLOROBENZENE	0.5 - 0.5	0 / 7	--	--	400	-- / --	0.001	NO
1,4-DICHLOROBENZENE	0.5 - 0.5	0 / 7	--	--	400	-- / --	0.001	NO
2-HEXANONE	5 - 10	0 / 14	--	--	NSV	-- / --	NSV	NO
ACETONE	5 - 5	0 / 7	--	--	NSV	-- / --	NSV	NO

TABLE L-28
Step 2 Screening Statistics and COPC Selection - SWMU 6 - Surface Water
SWMU 6 Former NASD, Vieques Island, Puerto Rico

Chemical	Detection Limit Range for Non-detects	Frequency of Detection	Maximum Concentration Detected	Sample ID of Maximum Concentration	Screening Value	Frequency of Exceedance	Maximum Hazard Quotient[1]	COPC?
BENZENE	0.5 - 10	0 / 14	--	--	12	-- / --	0.83	NO
BROMOCHLOROMETHANE	0.5 - 0.5	0 / 7	--	--	NSV	-- / --	NSV	NO
BROMODICHLOROMETHANE	0.5 - 10	0 / 14	--	--	NSV	-- / --	NSV	NO
BROMOFORM	0.5 - 10	0 / 14	--	--	43	-- / --	0.23	NO
BROMOMETHANE	0.5 - 10	0 / 14	--	--	NSV	-- / --	NSV	NO
CARBON DISULFIDE	0.5 - 10	0 / 14	--	--	NSV	-- / --	NSV	NO
CARBON TETRACHLORIDE	0.5 - 10	0 / 14	--	--	2.5	-- / --	4.00	--[3]
CHLOROBENZENE	0.5 - 10	0 / 14	--	--	680	-- / --	0.01	NO
CHLOROETHANE	0.5 - 10	0 / 14	--	--	NSV	-- / --	NSV	NO
CHLOROFORM	0.5 - 10	0 / 14	--	--	57	-- / --	0.18	NO
CHLOROMETHANE	0.5 - 10	0 / 14	--	--	NSV	-- / --	NSV	NO
cis-1,2-DICHLOROETHYLENE	0.5 - 0.5	0 / 7	--	--	NSV	-- / --	NSV	NO
cis-1,3-DICHLOROPROPENE	0.5 - 10	0 / 14	--	--	NSV	-- / --	NSV	NO
CYCLOHEXANE	0.5 - 0.5	0 / 7	--	--	NSV	-- / --	NSV	NO
DIBROMOCHLOROMETHANE	0.5 - 10	0 / 14	--	--	5.6	-- / --	1.79	--[3]
DICHLORODIFLUOROMETHANE	0.5 - 0.5	0 / 7	--	--	NSV	-- / --	NSV	NO
ETHYLBENZENE	0.5 - 10	0 / 14	--	--	3100	-- / --	0.003	NO
M,P-XYLENE (SUM OF ISOMERS)	10 - 10	0 / 7	--	--	NSV	-- / --	NSV	NO
METHYL ACETATE	2 - 2	0 / 7	--	--	NSV	-- / --	NSV	NO
METHYL ETHYL KETONE (2-BUTANONE)	5 - 5	0 / 7	--	--	NSV	-- / --	NSV	NO
METHYL ISOBUTYL KETONE (4-METHYL	5 - 10	0 / 14	--	--	NSV	-- / --	NSV	NO
METHYLCYCLOHEXANE	0.5 - 0.5	0 / 7	--	--	NSV	-- / --	NSV	NO
METHYLENE CHLORIDE	0.5 - 10	0 / 14	--	--	470	-- / --	0.02	NO
O-XYLENE (1,2-DIMETHYLBENZENE)	10 - 10	0 / 7	--	--	NSV	-- / --	NSV	NO
STYRENE	0.5 - 10	0 / 14	--	--	NSV	-- / --	NSV	NO
tert-BUTYL METHYL ETHER	0.5 - 0.5	0 / 7	--	--	NSV	-- / --	NSV	NO
TETRACHLOROETHYLENE(PCE)	0.5 - 10	0 / 14	--	--	8	-- / --	1.25	--[3]
TOLUENE	0.5 - 10	0 / 14	--	--	6800	-- / --	0.001	NO
trans-1,2-DICHLOROETHENE	0.5 - 0.5	0 / 7	--	--	NSV	-- / --	NSV	NO
trans-1,3-DICHLOROPROPENE	0.5 - 10	0 / 14	--	--	NSV	-- / --	NSV	NO
TRICHLOROETHYLENE (TCE)	0.5 - 10	0 / 14	--	--	27	-- / --	0.37	NO
TRICHLOROFLUOROMETHANE	0.5 - 0.5	0 / 7	--	--	NSV	-- / --	NSV	NO
VINYL CHLORIDE	0.5 - 10	0 / 14	--	--	2	-- / --	5.00	--[3]
XYLENES, TOTAL	2 - 10	0 / 14	--	--	NSV	-- / --	NSV	NO

TABLE L-28
Step 2 Screening Statistics and COPC Selection - SWMU 6 - Surface Water
SWMU 6 Former NASD, Vieques Island, Puerto Rico

Chemical	Detection Limit Range for Non-detects	Frequency of Detection	Maximum Concentration Detected	Sample ID of Maximum Concentration	Screening Value	Frequency of Exceedance	Maximum Hazard Quotient[1]	COPC?
Explosives (UG/L)								
1,3,5-TRINITROBENZENE	2.5 - 5	0 / 14	--	--	NSV	-- / --	NSV	NO
1,3-DINITROBENZENE	2.5 - 5	0 / 14	--	--	NSV	-- / --	NSV	NO
2,4,6-TRINITROTOLUENE	2.5 - 5	0 / 14	--	--	NSV	-- / --	NSV	NO
2,4-DINITROTOLUENE	2.5 - 5	0 / 14	--	--	0.11	-- / --	45.45	--[3]
2,6-DINITROTOLUENE	2.5 - 5	0 / 14	--	--	NSV	-- / --	NSV	NO
2-NITROTOLUENE	2.5 - 5	0 / 14	--	--	NSV	-- / --	NSV	NO
3-NITROTOLUENE	2.5 - 5	0 / 14	--	--	NSV	-- / --	NSV	NO
4-NITROTOLUENE	2.5 - 5	0 / 14	--	--	NSV	-- / --	NSV	NO
HEXAHYDRO-1,3,5-TRINITRO-1,3,5,7-TET	2.5 - 5	0 / 14	--	--	NSV	-- / --	NSV	NO
NITROBENZENE	2.5 - 5	0 / 14	--	--	17	-- / --	0.29	NO
OCTAHYDRO-1,3,5,7-TETRANITRO-1,3,5,	2.5 - 5	0 / 14	--	--	NSV	-- / --	NSV	NO
Perchlorate	20 - 20	0 / 7	--	--	NSV	-- / --	NSV	NO
TETRYL	2.5 - 5	0 / 14	--	--	NSV	-- / --	NSV	NO

NSV - No screening value
1 - Maximum HQ based on maximum concentration detected unless frequency of detection is zero, in which case it is based on maximum reporting limit - indicated by shaded cells.
2 - Macronutrient - Not considered to be a COPC.
3 - Chemical not detected, however detection limit exceeded screening value. Chemical not retained as COPC - see Section 7.5 (Uncertainties)

TABLE L-29
Step 2 Screening Statistics and COPC Selection - SWMU 6 - Sediment
SWMU 6 Former NASD, Vieques Island, Puerto Rico

Chemical	Detection Limit Range for Non-detects	Frequency of Detection	Maximum Concentration Detected	Sample ID of Maximum Concentration	Screening Value	Frequency of Exceedance	Maximum Hazard Quotient [1]	COPC?
Inorganics (MG/KG)								
ALUMINUM	-- - --	19 / 19	19300	NDA044	NSV	-- / --	NSV	**YES**
ANTIMONY	0.14 - 0.62	15 / 19	97.8	NDA043	12	1 / 19	8.15	**YES**
ARSENIC	-- - --	19 / 19	555	NDA043	7.24	3 / 19	76.66	**YES**
BARIUM	-- - --	19 / 19	571	NDA043	20	1 / 19	28.55	**YES**
BERYLLIUM	-- - --	19 / 19	14.2	NDA043	NSV	-- / --	NSV	**YES**
CADMIUM	0.0161 - 0.094	12 / 19	13.7	NDA043	1.2	1 / 19	11.42	**YES**
CALCIUM [2]	-- - --	19 / 19	135000	NDW06SD14-R01	NSV	-- / --	NSV	NO
CHROMIUM, TOTAL	-- - --	19 / 19	67.8	NDA043	81	0 / 19	0.84	NO
COBALT	-- - --	19 / 19	142	NDA043	NSV	-- / --	NSV	**YES**
COPPER	-- - --	19 / 19	101	NDA043	18.7	12 / 19	5.40	**YES**
IRON	-- - --	19 / 19	25700	NDA044	NSV	-- / --	NSV	**YES**
LEAD	-- - --	19 / 19	144	NDA043	30.2	2 / 19	4.77	**YES**
MAGNESIUM [2]	-- - --	19 / 19	11600	NDA044	NSV	-- / --	NSV	NO
MANGANESE	-- - --	19 / 19	388	NDW06SD08-R01	NSV	-- / --	NSV	**YES**
MERCURY	0.0087 - 0.052	14 / 19	0.21	NDA043	0.13	2 / 19	1.62	**YES**
NICKEL	-- - --	19 / 19	143	NDA043	15.9	1 / 19	8.99	**YES**
POTASSIUM [2]	-- - --	19 / 19	6550	NDA044	NSV	-- / --	NSV	NO
SELENIUM	0.237 - 0.35	14 / 19	544	NDA043	NSV	-- / --	NSV	**YES**
SILVER	0.0287 - 0.24	4 / 19	14.5	NDA043	2	1 / 19	7.25	**YES**
SODIUM [2]	-- - --	19 / 19	45700	NDA044	NSV	-- / --	NSV	NO
THALLIUM	0.144 - 1.2	5 / 19	572	NDA043	NSV	-- / --	NSV	**YES**
VANADIUM	-- - --	19 / 19	174	NDA043	NSV	-- / --	NSV	**YES**
ZINC	-- - --	14 / 14	241	NDW06SD10-R01	124	2 / 14	1.94	**YES**
Pesticides/Polychlorinated Biphenyls (MG/KG)								
PCB-1016 (AROCHLOR 1016)	0.041 - 0.156	0 / 19	--	--	0.033	-- / --	4.73	--[3]
PCB-1221 (AROCHLOR 1221)	0.083 - 0.315	0 / 19	--	--	0.033	-- / --	9.55	--[3]
PCB-1232 (AROCHLOR 1232)	0.041 - 0.156	0 / 19	--	--	0.033	-- / --	4.73	--[3]
PCB-1242 (AROCHLOR 1242)	0.041 - 0.156	0 / 19	--	--	0.033	-- / --	4.73	--[3]
PCB-1248 (AROCHLOR 1248)	0.041 - 0.156	0 / 19	--	--	0.033	-- / --	4.73	--[3]
PCB-1254 (AROCHLOR 1254)	0.041 - 0.156	0 / 19	--	--	0.033	-- / --	4.73	--[3]
PCB-1260 (AROCHLOR 1260)	0.041 - 0.156	0 / 19	--	--	0.033	-- / --	4.73	--[3]
ALDRIN	0.0021 - 0.054	0 / 17	--	--	NSV	-- / --	NSV	NO

TABLE L-29
Step 2 Screening Statistics and COPC Selection - SWMU 6 - Sediment
SWMU 6 Former NASD, Vieques Island, Puerto Rico

Chemical	Detection Limit Range for Non-detects	Frequency of Detection	Maximum Concentration Detected	Sample ID of Maximum Concentration	Screening Value	Frequency of Exceedance	Maximum Hazard Quotient [1]	COPC?
ALPHA BHC (ALPHA HEXACHLOROCYCLOHEXANE)	0.0021 - 0.054	0 / 17	--	--	NSV	-- / --	NSV	NO
ALPHA ENDOSULFAN	0.0021 - 0.054	0 / 17	--	--	NSV	-- / --	NSV	NO
ALPHA-CHLORDANE	0.0021 - 0.054	0 / 17	--	--	NSV	-- / --	NSV	NO
BETA BHC (BETA HEXACHLOROCYCLOHEXANE)	0.0021 - 0.054	0 / 17	--	--	NSV	-- / --	NSV	NO
BETA ENDOSULFAN	0.0041 - 0.1	0 / 17	--	--	NSV	-- / --	NSV	NO
DELTA BHC (DELTA HEXACHLOROCYCLOHEXANE)	0.0021 - 0.054	0 / 17	--	--	NSV	-- / --	NSV	NO
DIELDRIN	0.0041 - 0.1	0 / 17	--	--	0.0033	-- / --	30	--[3]
ENDOSULFAN SULFATE	0.0041 - 0.1	0 / 17	--	--	NSV	-- / --	NSV	NO
ENDRIN	0.0041 - 0.1	0 / 17	--	--	0.0033	-- / --	30	--[3]
ENDRIN ALDEHYDE	0.0041 - 0.1	0 / 17	--	--	NSV	-- / --	NSV	NO
ENDRIN KETONE	0.0041 - 0.1	0 / 17	--	--	NSV	-- / --	NSV	NO
GAMMA BHC (LINDANE)	0.0021 - 0.054	0 / 17	--	--	0.0033	-- / --	16	--[3]
GAMMA-CHLORDANE	0.0021 - 0.054	0 / 17	--	--	NSV	-- / --	NSV	NO
HEPTACHLOR	0.0021 - 0.054	0 / 17	--	--	NSV	-- / --	NSV	NO
HEPTACHLOR EPOXIDE	0.0021 - 0.054	0 / 17	--	--	NSV	-- / --	NSV	NO
METHOXYCHLOR	0.021 - 0.54	0 / 17	--	--	NSV	-- / --	NSV	NO
p,p'-DDD	0.0041 - 0.1	6 / 18	0.67	NDW06SD13-R01	0.0033	2 / 18	203	**YES**
p,p'-DDE	0.0049 - 0.1	5 / 17	0.41	NDW06SD13-R01	0.0033	3 / 17	124	**YES**
p,p'-DDT	0.0043 - 0.016	3 / 18	0.0086	NDW06SD05-R01	0.0033	1 / 18	2.61	**YES**
TOXAPHENE	0.21 - 5.4	0 / 17	--	--	NSV	-- / --	NSV	NO
Semi-volatile Organic Compounds (MG/KG)								
1,2,4-TRICHLOROBENZENE	0.686 - 2.3	0 / 7	--	--	9.2	-- / --	0.25	NO
1,2-DICHLOROBENZENE	0.686 - 2.3	0 / 7	--	--	0.34	-- / --	6.76	--[3]
1,3-DICHLOROBENZENE	0.686 - 2.3	0 / 7	--	--	1.7	-- / --	1.35	--[3]
1,4-DICHLOROBENZENE	0.686 - 2.3	0 / 7	--	--	0.35	-- / --	6.57	--[3]
2,4,5-TRICHLOROPHENOL	1.22 - 6.9	0 / 19	--	--	NSV	-- / --	NSV	NO
2,4,6-TRICHLOROPHENOL	0.433 - 2.3	0 / 13	--	--	NSV	-- / --	NSV	NO
2,4-DICHLOROPHENOL	0.408 - 2.3	0 / 19	--	--	NSV	-- / --	NSV	NO
2,4-DIMETHYLPHENOL	0.408 - 2.3	0 / 19	--	--	NSV	-- / --	NSV	NO
2,4-DINITROPHENOL	1.22 - 6.9	0 / 19	--	--	NSV	-- / --	NSV	NO
2,4-DINITROTOLUENE	0.408 - 2.3	0 / 19	--	--	NSV	-- / --	NSV	NO
2,6-DINITROTOLUENE	0.408 - 2.3	0 / 19	--	--	NSV	-- / --	NSV	NO
2-CHLORONAPHTHALENE	0.408 - 2.3	0 / 19	--	--	NSV	-- / --	NSV	NO

TABLE L-29
Step 2 Screening Statistics and COPC Selection - SWMU 6 - Sediment
SWMU 6 Former NASD, Vieques Island, Puerto Rico

Chemical	Detection Limit Range for Non-detects	Frequency of Detection	Maximum Concentration Detected	Sample ID of Maximum Concentration	Screening Value	Frequency of Exceedance	Maximum Hazard Quotient [1]	COPC?
2-CHLOROPHENOL	0.408 - 2.3	0 / 19	--	--	NSV	-- / --	NSV	NO
2-METHYLNAPHTHALENE	0.408 - 2.3	0 / 19	--	--	0.33	-- / --	6.97	--[3]
2-METHYLPHENOL (o-CRESOL)	0.408 - 2.3	0 / 19	--	--	NSV	-- / --	NSV	NO
2-NITROANILINE	1.22 - 6.9	0 / 19	--	--	NSV	-- / --	NSV	NO
2-NITROPHENOL	0.408 - 2.3	0 / 19	--	--	NSV	-- / --	NSV	NO
3,3'-DICHLOROBENZIDINE	0.827 - 4.6	0 / 19	--	--	NSV	-- / --	NSV	NO
3-NITROANILINE	1.22 - 6.9	0 / 19	--	--	NSV	-- / --	NSV	NO
4,6-DINITRO-2-METHYLPHENOL	1.22 - 6.9	0 / 19	--	--	NSV	-- / --	NSV	NO
4-BROMOPHENYL PHENYL ETHER	0.408 - 2.3	0 / 19	--	--	NSV	-- / --	NSV	NO
4-CHLORO-3-METHYLPHENOL	0.408 - 2.3	0 / 19	--	--	NSV	-- / --	NSV	NO
4-CHLOROANILINE	0.408 - 2.3	0 / 13	--	--	NSV	-- / --	NSV	NO
4-CHLOROPHENYL PHENYL ETHER	0.408 - 2.3	0 / 19	--	--	NSV	-- / --	NSV	NO
4-METHYLPHENOL (p-CRESOL)	0.408 - 1.06	0 / 12	--	--	NSV	-- / --	NSV	NO
4-NITROANILINE	1.22 - 6.9	0 / 19	--	--	NSV	-- / --	NSV	NO
4-NITROPHENOL	1.22 - 6.9	0 / 19	--	--	NSV	-- / --	NSV	NO
ACENAPHTHENE	0.408 - 2.3	0 / 19	--	--	0.016	-- / --	143.75	--[3]
ACENAPHTHYLENE	0.408 - 2.3	0 / 19	--	--	0.33	-- / --	6.97	--[3]
ACETOPHENONE	0.408 - 1.06	0 / 12	--	--	NSV	-- / --	NSV	NO
ANTHRACENE	0.408 - 2.3	1 / 19	0.038	NDW06SD12-R01	0.33	0 / 19	0.12	NO
ATRAZINE	0.408 - 1.06	0 / 12	--	--	NSV	-- / --	NSV	NO
BENZO(a)ANTHRACENE	0.408 - 2.3	1 / 19	0.0646	NDW06SD12-R01	0.33	0 / 19	0.20	NO
BENZO(a)PYRENE	0.408 - 2.3	1 / 19	0.0797	NDW06SD12-R01	0.33	0 / 19	0.24	NO
BENZO(b)FLUORANTHENE	0.408 - 2.3	1 / 19	0.0916	NDW06SD12-R01	0.33	0 / 19	0.28	NO
BENZO(g,h,i)PERYLENE	0.433 - 2.3	1 / 19	0.0409	NDW06SD10-R01	0.655	0 / 19	0.06	NO
BENZO(k)FLUORANTHENE	0.408 - 2.3	1 / 19	0.0784	NDW06SD12-R01	0.33	0 / 19	0.24	NO
BENZYL BUTYL PHTHALATE	0.408 - 2.3	0 / 19	--	--	NSV	-- / --	NSV	NO
BIPHENYL (DIPHENYL)	0.408 - 1.06	0 / 12	--	--	NSV	-- / --	NSV	NO
bis(2-CHLOROETHOXY) METHANE	0.433 - 2.3	0 / 13	--	--	0.1	-- / --	23.00	--[3]
bis(2-CHLOROETHYL) ETHER (2-CHLOROETHYL ETHER)	0.408 - 2.3	0 / 19	--	--	NSV	-- / --	NSV	NO
bis(2-CHLOROISOPROPYL) ETHER	0.408 - 2.3	0 / 19	--	--	NSV	-- / --	NSV	NO
bis(2-ETHYLHEXYL) PHTHALATE	0.408 - 2.3	6 / 19	0.446	NDW06SD05-R01	0.182	2 / 19	2.45	**YES**
CAPROLACTAM	0.408 - 1.06	0 / 12	--	--	NSV	-- / --	NSV	NO
CARBAZOLE	0.408 - 2.3	0 / 19	--	--	NSV	-- / --	NSV	NO
CHRYSENE	0.408 - 2.3	1 / 19	0.068	NDW06SD12-R01	0.33	0 / 19	0.21	NO

TABLE L-29
Step 2 Screening Statistics and COPC Selection - SWMU 6 - Sediment
SWMU 6 Former NASD, Vieques Island, Puerto Rico

Chemical	Detection Limit Range for Non-detects	Frequency of Detection	Maximum Concentration Detected	Sample ID of Maximum Concentration	Screening Value	Frequency of Exceedance	Maximum Hazard Quotient [1]	COPC?
CRESOLS, m & p	0.686 - 2.3	0 / 7	--	--	NSV	-- / --	NSV	NO
DI-n-BUTYL PHTHALATE	0.408 - 2.3	0 / 19	--	--	NSV	-- / --	NSV	NO
DI-n-OCTYLPHTHALATE	0.408 - 2.3	0 / 19	--	--	NSV	-- / --	NSV	NO
DIBENZ(a,h)ANTHRACENE	0.408 - 2.3	0 / 19	--	--	0.33	-- / --	6.97	--[3]
DIBENZOFURAN	0.408 - 2.3	0 / 19	--	--	NSV	-- / --	NSV	NO
DIETHYL PHTHALATE	0.408 - 2.3	0 / 19	--	--	NSV	-- / --	NSV	NO
DIMETHYL PHTHALATE	0.408 - 2.3	0 / 19	--	--	NSV	-- / --	NSV	NO
FLUORANTHENE	0.408 - 2.3	1 / 19	0.0363	NDW06SD12-R01	0.33	0 / 19	0.11	NO
FLUORENE	0.408 - 2.3	0 / 19	--	--	0.33	-- / --	6.97	--[3]
HEXACHLOROBENZENE	0.408 - 2.3	0 / 19	--	--	NSV	-- / --	NSV	NO
HEXACHLOROBUTADIENE	0.408 - 2.3	0 / 19	--	--	NSV	-- / --	NSV	NO
HEXACHLOROCYCLOPENTADIENE	0.408 - 2.3	0 / 19	--	--	NSV	-- / --	NSV	NO
HEXACHLOROETHANE	0.433 - 2.3	0 / 13	--	--	NSV	-- / --	NSV	NO
INDENO(1,2,3-c,d)PYRENE	0.408 - 2.3	0 / 19	--	--	0.665	-- / --	3.46	--[3]
ISOPHORONE	0.408 - 2.3	0 / 19	--	--	NSV	-- / --	NSV	NO
N-NITROSODI-n-PROPYLAMINE	0.408 - 2.3	0 / 19	--	--	NSV	-- / --	NSV	NO
N-NITROSODIPHENYLAMINE	0.408 - 2.3	0 / 19	--	--	NSV	-- / --	NSV	NO
NAPHTHALENE	0.433 - 2.3	0 / 13	--	--	0.33	-- / --	6.97	--[3]
NITROBENZENE	0.408 - 2.3	0 / 19	--	--	NSV	-- / --	NSV	NO
PENTACHLOROPHENOL	1.22 - 6.9	0 / 19	--	--	0.36	-- / --	19.17	--[3]
PHENANTHRENE	0.408 - 2.3	0 / 19	--	--	0.33	-- / --	6.97	--[3]
PHENOL	0.408 - 2.3	0 / 19	--	--	NSV	-- / --	NSV	NO
PYRENE	0.408 - 2.3	2 / 19	0.0504	NDW06SD12-R01	0.33	0 / 19	0.15	NO
Volatile Organic Compounds (MG/KG)								
1,1,1-TRICHLOROETHANE	0.0109 - 0.0597	0 / 19	--	--	0.17	-- / --	0.35	NO
1,1,2,2-TETRACHLOROETHANE	0.0109 - 0.0597	0 / 19	--	--	0.94	-- / --	0.06	NO
1,1,2-TRICHLORO-1,2,2-TRIFLUOROETHANE	0.0109 - 0.0597	0 / 12	--	--	NSV	-- / --	NSV	NO
1,1,2-TRICHLOROETHANE	0.0109 - 0.0597	0 / 19	--	--	NSV	-- / --	NSV	NO
1,1-DICHLOROETHANE	0.0109 - 0.0597	0 / 19	--	--	NSV	-- / --	NSV	NO
1,1-DICHLOROETHENE	0.0109 - 0.0597	0 / 19	--	--	NSV	-- / --	NSV	NO
1,2,4-TRICHLOROBENZENE	0.0109 - 0.0597	0 / 12	--	--	9.2	-- / --	0.01	NO
1,2-DIBROMO-3-CHLOROPROPANE	0.0109 - 0.0597	0 / 12	--	--	NSV	-- / --	NSV	NO
1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	0.0109 - 0.0597	0 / 12	--	--	NSV	-- / --	NSV	NO

TABLE L-29
Step 2 Screening Statistics and COPC Selection - SWMU 6 - Sediment
SWMU 6 Former NASD, Vieques Island, Puerto Rico

Chemical	Detection Limit Range for Non-detects	Frequency of Detection	Maximum Concentration Detected	Sample ID of Maximum Concentration	Screening Value	Frequency of Exceedance	Maximum Hazard Quotient [1]	COPC?
1,2-DICHLOROBENZENE	0.0109 - 0.0597	0 / 12	--	--	0.34	-- / --	0.18	NO
1,2-DICHLOROETHANE	0.0109 - 0.0597	0 / 19	--	--	NSV	-- / --	NSV	NO
1,2-DICHLOROPROPANE	0.0109 - 0.0597	0 / 19	--	--	NSV	-- / --	NSV	NO
1,3-DICHLOROBENZENE	0.0109 - 0.0597	0 / 12	--	--	1.7	-- / --	0.04	NO
1,4-DICHLOROBENZENE	0.0109 - 0.0597	0 / 12	--	--	0.35	-- / --	0.17	NO
2-HEXANONE	0.0109 - 0.0597	0 / 19	--	--	NSV	-- / --	NSV	NO
ACETONE	0.0109 - 0.0597	3 / 12	0.604	NDW06SD14-R01	NSV	-- / --	NSV	**YES**
BENZENE	0.0109 - 0.0597	0 / 19	--	--	NSV	-- / --	NSV	NO
BROMODICHLOROMETHANE	0.0109 - 0.0597	0 / 19	--	--	NSV	-- / --	NSV	NO
BROMOFORM	0.0109 - 0.0597	0 / 19	--	--	NSV	-- / --	NSV	NO
BROMOMETHANE	0.0109 - 0.0597	0 / 19	--	--	NSV	-- / --	NSV	NO
CARBON DISULFIDE	0.0109 - 0.0525	12 / 19	0.022	NDA044	NSV	-- / --	NSV	**YES**
CARBON TETRACHLORIDE	0.0109 - 0.0597	0 / 19	--	--	NSV	-- / --	NSV	NO
CHLOROBENZENE	0.0109 - 0.0597	0 / 19	--	--	NSV	-- / --	NSV	NO
CHLOROETHANE	0.0109 - 0.0597	0 / 19	--	--	NSV	-- / --	NSV	NO
CHLOROFORM	0.0109 - 0.0597	0 / 19	--	--	NSV	-- / --	NSV	NO
CHLOROMETHANE	0.0109 - 0.0597	0 / 19	--	--	NSV	-- / --	NSV	NO
cis-1,2-DICHLOROETHYLENE	0.0109 - 0.0597	0 / 12	--	--	NSV	-- / --	NSV	NO
cis-1,3-DICHLOROPROPENE	0.0109 - 0.0597	0 / 19	--	--	NSV	-- / --	NSV	NO
CYCLOHEXANE	0.0109 - 0.0597	0 / 12	--	--	NSV	-- / --	NSV	NO
DIBROMOCHLOROMETHANE	0.0109 - 0.0597	0 / 19	--	--	NSV	-- / --	NSV	NO
DICHLORODIFLUOROMETHANE	0.0109 - 0.0597	0 / 12	--	--	NSV	-- / --	NSV	NO
ETHYLBENZENE	0.0109 - 0.0597	3 / 19	0.002	NDA046	NSV	-- / --	NSV	**YES**
ISOPROPYLBENZENE (CUMENE)	0.0109 - 0.0597	0 / 12	--	--	NSV	-- / --	NSV	NO
M,P-XYLENE (SUM OF ISOMERS)	0.011 - 0.026	5 / 7	0.013	NDA044	0.04	-- / --	0.33	NO
METHYL ACETATE	0.0109 - 0.0597	0 / 12	--	--	NSV	-- / --	NSV	NO
METHYL ETHYL KETONE (2-BUTANONE)	0.0109 - 0.0597	5 / 17	0.017	NDA044	NSV	-- / --	NSV	**YES**
METHYL ISOBUTYL KETONE (4-METHYL-2-PENTANONE)	0.0109 - 0.0597	0 / 19	--	--	NSV	-- / --	NSV	NO
METHYLCYCLOHEXANE	0.0109 - 0.0597	0 / 12	--	--	NSV	-- / --	NSV	NO
METHYLENE CHLORIDE	0.011 - 0.059	12 / 19	0.0082	NDW06SD07-R01	NSV	-- / --	NSV	**YES**
O-XYLENE (1,2-DIMETHYLBENZENE)	0.011 - 0.026	4 / 7	0.003	NDA044, NDA046	0.04	-- / --	0.08	NO
STYRENE	0.0109 - 0.0597	0 / 19	--	--	NSV	-- / --	NSV	NO
tert-BUTYL METHYL ETHER	0.0109 - 0.0597	0 / 12	--	--	NSV	-- / --	NSV	NO
TETRACHLOROETHYLENE(PCE)	0.0109 - 0.0597	0 / 19	--	--	NSV	-- / --	NSV	NO

TABLE L-29
Step 2 Screening Statistics and COPC Selection - SWMU 6 - Sediment
SWMU 6 Former NASD, Vieques Island, Puerto Rico

Chemical	Detection Limit Range for Non-detects	Frequency of Detection	Maximum Concentration Detected	Sample ID of Maximum Concentration	Screening Value	Frequency of Exceedance	Maximum Hazard Quotient [1]	COPC?
TOLUENE	0.0109 - 0.0597	4 / 19	0.003	, NDA303, NDA046,	NSV	-- / --	NSV	**YES**
trans-1,2-DICHLOROETHENE	0.0109 - 0.0597	0 / 12	--	--	NSV	-- / --	NSV	NO
trans-1,3-DICHLOROPROPENE	0.0109 - 0.0597	0 / 19	--	--	NSV	-- / --	NSV	NO
TRICHLOROETHYLENE (TCE)	0.0109 - 0.0597	0 / 19	--	--	NSV	-- / --	NSV	NO
TRICHLOROFLUOROMETHANE	0.0109 - 0.0597	0 / 12	--	--	NSV	-- / --	NSV	NO
VINYL CHLORIDE	0.0109 - 0.0597	0 / 19	--	--	NSV	-- / --	NSV	NO
XYLENES, TOTAL	0.0109 - 0.0597	5 / 19	0.016	NDA044	0.04	0 / 19	0.40	NO
Explosives (MG/KG)								
1,3,5-TRINITROBENZENE	0.157 - 1.16	0 / 19	--	--	NSV	-- / --	NSV	NO
1,3-DINITROBENZENE	0.157 - 1.16	0 / 19	--	--	NSV	-- / --	NSV	NO
2,4,6-TRINITROTOLUENE	0.157 - 1.16	0 / 19	--	--	NSV	-- / --	NSV	NO
2,4-DINITROTOLUENE	0.157 - 1.16	0 / 19	--	--	NSV	-- / --	NSV	NO
2,6-DINITROTOLUENE	0.157 - 1.16	0 / 19	--	--	NSV	-- / --	NSV	NO
2-NITROTOLUENE	0.157 - 1.16	0 / 19	--	--	NSV	-- / --	NSV	NO
3-NITROTOLUENE	0.157 - 1.16	0 / 19	--	--	NSV	-- / --	NSV	NO
4-NITROTOLUENE	0.157 - 1.16	0 / 19	--	--	NSV	-- / --	NSV	NO
HEXAHYDRO-1,3,5-TRINITRO-1,3,5,7-TETRAZOCINE	0.157 - 1.16	0 / 19	--	--	NSV	-- / --	NSV	NO
NITROBENZENE	0.157 - 1.16	0 / 19	--	--	NSV	-- / --	NSV	NO
OCTAHYDRO-1,3,5,7-TETRANITRO-1,3,5,7-TETRAZOCINE	0.157 - 1.16	0 / 19	--	--	NSV	-- / --	NSV	NO
Perchlorate	0.131 - 0.35	0 / 12	--	--	NSV	-- / --	NSV	NO
TETRYL	0.157 - 1.16	0 / 19	--	--	NSV	-- / --	NSV	NO

NSV - No screening value
1 - Maximum HQ based on maximum concentration detected unless frequency of detection is zero, in which case it is based on maximum reporting limit - indicated by shaded cells.
2 - Macronutrient - Not considered to be a COPC.
3 - Chemical not detected, however detection limit exceeded screening value. Chemical not retained as COPC - see Section 7.5 (Uncertainties)

TABLE L-30
Summary of COPCs - Step 2
SWMU 6 Former NASD, Vieques Island, Puerto Rico

Chemical	Surface Soil		Food Web	
	MD	NSV	MD	NSV
Inorganics				
Aluminum				
Arsenic			X	
Cadmium			X	
Chromium			X	
Cobalt				
Copper			X	
Iron				
Lead			X	
Manganese				
Mercury			X	
Nickel				
Selenium			X	
Thallium				
Vanadium				
Zinc			X	
Pesticides/PCBs				
Heptachlor				
p,p'-DDD			X	
p,p'-DDE			X	
p,p'-DDT				
Aroclor-1016			X*	
Aroclor-1221			X*	
Aroclor-1232			X*	
Aroclor-1242			X*	
Aroclor-1248			X*	
Aroclor-1254				
Aroclor-1260			X*	
beta-BHC				
delta-BHC				
Dieldrin			X*	
Endrin			X*	
Toxaphene			X*	
Semivolatile Organic Compounds				
4-Bromophenyl-phenylether				X*
4-Chlorophenyl-phenylether				X*
Benzo(a)anthracene				
Benzo(a)pyrene				
Benzo(b)fluoranthene				
Benzo(k)fluoranthene				
Benzyl butyl phthalate				
bis(2-ethylhexyl)phthalate				
Carbazole				
Chrysene				
Dibenz(a,h)anthracene				
Fluoranthene				
Hexachlorocyclopentadiene				X*
Hexachloroethane				X*
Hexachlorobenzene			X*	
Indeno (1,2,3-c,d) pyrene				
Pyrene				
Volatile Organic Compounds				
1,1,2,2-Tetrachloroethane				X*
2-Hexanone				
Acetone				

MD - Result based on maximum detection
NSV - Result based on no screening value available
* - Chemical was not detected; maximum detection limit used in analysis

TABLE L-31
Summary of Hazard Quotients for Upper Trophic Level Receptors - Step 2
SWMU 6 Former NASD, Vieques Island, Puerto Rico

Chemical	Terrestrial								Aquatic			
	Norway rat		Indian mongoose		Pearly-eyed thrasher		Red-tailed hawk		Spotted sandpiper		Green heron	
	NOAEL	LOAEL	NOAEL	LOAEL	NOAEL	LOAEL	NOAEL	LOAEL	NOAEL	LOAEL	NOAEL	LOAEL
Inorganics												
Arsenic	**2.82**	0.56	**2.28**	0.46	0.29	0.10	<0.01	<0.01	**25.48**	**10.20**	**9.07**	**3.63**
Cadmium	**3.32**	0.33	**8.72**	**1.74**	**4.15**	0.30	0.02	<0.01	**8.07**	0.59	**2.76**	0.20
Chromium	**2.32**	0.46	**4.84**	0.97	**14.38**	**2.88**	0.62	0.12	**7.13**	**1.43**	**1.59**	0.32
Copper	0.42	0.31	**5.03**	**3.89**	**1.06**	0.81	<0.01	<0.01	**4.56**	**3.47**	**1.48**	**1.13**
Lead	**8.45**	0.84	**15.17**	**1.52**	**28.28**	**5.66**	**1.89**	0.38	**5.29**	**1.06**	**1.56**	0.31
Mercury	**3.51**	0.70	**1.29**	0.78	0.38	0.15	<0.01	<0.01	**6.47**	**2.16**	**9.56**	**3.19**
Nickel	0.17	0.08	0.46	0.18	0.14	0.10	<0.01	<0.01	0.21	0.15	0.41	0.30
Selenium	0.52	0.31	**14.46**	**8.76**	0.23	0.07	0.05	0.02	**430.28**	**215.14**	**87.64**	**17.53**
Silver	0.04	<0.01	0.08	0.02	0.09	0.02	<0.01	<0.01	0.04	<0.01	0.09	0.02
Zinc	**2.18**	**1.09**	**31.22**	**6.24**	**41.91**	**4.64**	**3.47**	0.38	**21.47**	**2.38**	**7.15**	0.79
Pesticides/PCBs												
4,4'-DDD	<0.01	<0.01	<0.01	<0.01	0.01	<0.01	<0.01	<0.01	0.82	0.16	**1.10**	0.11
4,4'-DDE	0.05	0.01	0.09	0.02	0.16	0.02	0.07	0.01	**3.17**	0.63	**7.76**	0.78
4,4'-DDT	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.06	<0.01
Aldrin	0.03	<0.01	0.06	0.01	0.14	0.03	<0.01	<0.01	0.11	0.02	0.10	0.02
alpha-BHC	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.03	<0.01	0.03	<0.01
alpha-Chlordane	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.02	<0.01	0.02	<0.01
Aroclor-1016	**3.55**	0.71	0.73	0.29	**2.25**	0.45	0.15	0.03	0.60	0.12	0.47	0.09
Aroclor-1221	**6.99**	**1.40**	**14.34**	**2.87**	**4.43**	0.89	0.30	0.06	**1.20**	0.24	0.95	0.19
Aroclor-1232	**3.55**	0.71	**7.30**	**1.46**	**2.25**	0.45	0.15	0.03	0.60	0.12	0.47	0.09
Aroclor-1242	**3.55**	0.71	**7.30**	**1.46**	**2.25**	0.45	0.15	0.03	0.60	0.12	0.47	0.09
Aroclor-1248	**3.55**	0.71	**7.19**	**1.46**	**2.25**	0.45	0.15	0.03	0.60	0.12	0.47	0.09
Aroclor-1254	0.27	0.05	0.67	0.14	0.17	0.03	0.01	<0.01	0.60	0.12	0.47	0.09
Aroclor-1260	**3.55**	0.71	**7.19**	**1.46**	**2.25**	0.45	0.15	0.03	0.60	0.12	0.47	0.09
beta-BHC	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.03	<0.01	0.03	<0.01
delta-BHC	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.03	<0.01	0.03	<0.01
Dieldrin	0.63	0.13	**1.89**	0.38	0.61	0.12	0.04	<0.01	**1.60**	0.32	0.76	0.15
Endosulfan I	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Endosulfan II	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Endrin	0.07	0.01	0.13	0.03	**1.12**	0.22	0.09	0.02	0.11	0.02	0.10	0.02
gamma-BHC (Lindane)	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.02	<0.01
gamma-Chlordane	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.02	<0.01	0.02	<0.01
Heptachlor	0.01	<0.01	0.05	0.01	0.03	<0.01	<0.01	<0.01	0.04	<0.01	0.03	<0.01

TABLE L-31
Summary of Hazard Quotients for Upper Trophic Level Receptors - Step 2
SWMU 6 Former NASD, Vieques Island, Puerto Rico

Chemical	Terrestrial								Aquatic			
	Norway rat		Indian mongoose		Pearly-eyed thrasher		Red-tailed hawk		Spotted sandpiper		Green heron	
	NOAEL	LOAEL	NOAEL	LOAEL	NOAEL	LOAEL	NOAEL	LOAEL	NOAEL	LOAEL	NOAEL	LOAEL
Heptachlor epoxide	0.04	<0.01	0.14	0.03	0.09	0.02	<0.01	<0.01	0.04	<0.01	0.03	<0.01
Methoxychlor	<0.01	<0.01	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Toxaphene	0.02	<0.01	0.05	0.01	0.33	0.07	0.02	<0.01	**1.71**	0.34	**1.57**	0.31
Semivolatile Organics												
1,2,4-Trichlorobenzene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.01	<0.01	<0.01	<0.01
1,2-Dichlorobenzene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.02	<0.01	<0.01	<0.01
1,3-Dichlorobenzene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.02	<0.01	<0.01	<0.01
1,4-Dichlorobenzene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.02	<0.01	<0.01	<0.01
Acenaphthene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.19	0.04	0.12	0.02
Acenaphthylene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.19	0.04	0.12	0.02
Anthracene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Benzo(a)anthracene	0.02	<0.01	0.05	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Benzo(a)pyrene	0.02	<0.01	0.04	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Benzo(b)fluoranthene	0.01	<0.01	0.04	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Benzo(g,h,i)perylene	<0.01	<0.01	0.02	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Benzo(k)fluoranthene	<0.01	<0.01	0.03	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Chrysene	0.03	<0.01	0.07	0.01	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Dibenz(a,h)anthracene	<0.01	<0.01	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.04	<0.01	0.07	0.01
Fluoranthene	<0.01	<0.01	<0.01	<0.01	0.03	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Fluorene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.11	0.02	0.10	0.02
Hexachlorobenzene	0.07	0.04	0.14	0.01	**1.22**	0.24	0.08	0.02	**5.70**	**1.14**	**5.41**	**1.08**
Hexachlorobutadiene	0.02	<0.01	0.05	<0.01	0.03	<0.01	<0.01	<0.01	0.15	0.03	0.09	0.02
Hexachlorocyclopentadiene	<0.01	<0.01	<0.01	<0.01	NA	NA	NA	NA	NA	NA	NA	NA
Hexachloroethane	<0.01	<0.01	<0.01	<0.01	NA	NA	NA	NA	NA	NA	NA	NA
Indeno(1,2,3-cd)pyrene	0.01	<0.01	0.04	<0.01	<0.01	<0.01	<0.01	<0.01	0.05	<0.01	0.08	0.02
Pentachlorophenol	0.20	0.04	0.42	0.08	0.45	0.22	0.03	0.02	0.51	0.26	0.47	0.23
Phenanthrene	<0.01	<0.01	<0.01	<0.01	0.03	<0.01	<0.01	<0.01	0.07	0.01	0.08	0.02
Pyrene	0.04	<0.01	0.09	0.02	0.02	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Volatile Organics												
1,1,2,2-Tetrachloroethane	<0.01	<0.01	<0.01	<0.01	NA	NA	NA	NA	NA	NA	NA	NA

TABLE L-32
Soil Bioconcentration and Bioaccumulation Factors For Plants, Soil Invertebrates, and Small Mammals - Step 3
SWMU 6 Former NASD, Vieques Island, Puerto Rico

Chemical	Soil-Plant BCF (dry weight)		Soil-Invertebrate BAF (dry weight)		Soil-Rat BAF (dry weight)	
	Value	Reference	Value	Reference	Value	Reference
Inorganics						
Arsenic	0.037	Bechtel Jacobs 1998a	0.258	Sample et al. 1998a	0.003	Sample et al. 1998b
Cadmium	0.514	Bechtel Jacobs 1998a	7.660	Sample et al. 1998a	0.144	Sample et al. 1998b
Chromium	0.048	Bechtel Jacobs 1998a	0.320	Sample et al. 1998a	0.092	Sample et al. 1998b
Copper	0.123	Bechtel Jacobs 1998a	0.468	Sample et al. 1998a	0.111	Sample et al. 1998b
Lead	0.038	Bechtel Jacobs 1998a	0.307	Sample et al. 1998a	0.055	Sample et al. 1998b
Mercury	0.344	Bechtel Jacobs 1998a	1.186	Sample et al. 1998a	0.054	Sample et al. 1998b
Selenium	0.567	Bechtel Jacobs 1998a	0.982	Sample et al. 1998a	0.258	Sample et al. 1998b
Zinc	0.358	Bechtel Jacobs 1998a	2.482	Sample et al. 1998a	0.509	Sample et al. 1998b
Pesticides/PCBs						
Aroclor-1016	0.0224	Travis and Arms 1988	4.30	Sample et al. 1998a	--	see text
Aroclor-1221	0.0744	Travis and Arms 1988	4.30	Sample et al. 1998a	--	see text
Aroclor-1232	0.0437	Travis and Arms 1988	4.30	Sample et al. 1998a	--	see text
Aroclor-1242	0.0224	Travis and Arms 1988	4.30	Sample et al. 1998a	--	see text
Aroclor-1248	0.0101	Travis and Arms 1988	4.30	Sample et al. 1998a	--	see text
Aroclor-1260	0.0045	Travis and Arms 1988	4.30	Sample et al. 1998a	--	see text
Dieldrin	0.0305	Travis and Arms 1988	8.00	Beyer and Gish 1980	--	see text
Endrin	0.0461	Travis and Arms 1988	3.60	Edwards and Bohlen 1992	--	see text
Semivolatile Organics						
Hexachlorobenzene	0.0153	Travis and Arms 1988	1.69	Beyer 1996	--	see text

TABLE L-33
Sediment Bioaccumulation Factors For Benthic Invertebrates and Fish - Step 3
SWMU 6 Former NASD, Vieques Island, Puerto Rico

Chemical	Sediment-Invertebrate BAF (dry weight)		Sediment-Fish BAF (dry weight)	
	Value	Reference	Value	Reference
Inorganics				
Arsenic	0.466	Bechtel Jacobs 1998b	0.126	Pascoe et al. 1996
Cadmium	0.679	Bechtel Jacobs 1998b	0.164	Pascoe et al. 1996
Chromium	0.083	Bechtel Jacobs 1998b	0.038	Krantzberg and Boyd 1992
Copper	0.919	Bechtel Jacobs 1998b	0.100	Krantzberg and Boyd 1992
Lead	0.080	Bechtel Jacobs 1998b	0.070	Krantzberg and Boyd 1992
Mercury	1.077	Bechtel Jacobs 1998b	3.250	Cope et al. 1990
Selenium	1.000	--	1.000	--
Zinc	0.954	Bechtel Jacobs 1998b	0.147	Pascoe et al. 1996
Pesticides/PCBs				
4,4'-DDD	0.230	Oliver and Niimi 1988	2.250	Oliver and Niimi 1988
4,4'-DDE	2.000	Oliver and Niimi 1988	26.200	Oliver and Niimi 1988
Aroclor-1221	1.919	Bechtel Jacobs 1998b	12.940	Oliver and Niimi 1988
Dieldrin	4.520	Standley 1997	1.000	--
Toxaphene	1.000	--	1.000	--
Semivolatile Organics				
Hexachlorobenzene	0.520	Oliver and Niimi 1988	0.940	Oliver and Niimi 1988

TABLE L-34
Exposure Parameters for Upper Trophic Level Ecological Receptors - Step 3
SWMU 6 Former NASD, Vieques Island, Puerto Rico

Receptor	Body Weight (kg)		Water Ingestion Rate (L/day)		Food Ingestion Rate (kg/day - dry)	
	Value	Reference	Value	Reference	Value	Reference
Birds						
Pearly-eyed thrasher	0.096	Oberle 2000	0.0123	allometric equation	0.0127	allometric equation
Green heron	0.212	Dunning 1993	0.0209	allometric equation	0.0405	allometric equation
Red-tailed hawk	1.13	Sample and Suter 1994	0.0639	allometric equation	0.0360	Sample and Suter 1994
Spotted sandpiper	0.040	Dunning 1993	0.0069	allometric equation	0.0072	allometric equation
Mammals						
Norway rat	0.438	Pass and Freeth 1993	0.0470	allometric equation	0.0192	allometric equation
Indian mongoose	0.434	Nellis 1989	0.0467	allometric equation	0.0346	allometric equation

TABLE 7-34
Exposure Parameters for Upper Trophic Level Ecological Receptors - Step 3
SWMU 6 Former NASD, Vieques Island, Puerto Rico

Receptor	Dietary Composition (percent)							Soil/ Sediment Ingestion (percent)	
	Terr. Plants	Soil Invert.	Small Mammals	Fish	Aquatic Plants	Benthic Invert.	Reference	Value	Reference
Birds									
Pearly-eyed thrasher	20	75	0	0	0	0	Oberle 2000; estimated based on description of diet	4.6	Sample and Suter 1994; value is for American robin
Green heron	0	0	0	71	0	29	Sample et al. 1997	0	Sample et al. 1997
Red-tailed hawk	0	0	100	0	0	0	EPA 1993a; Sample and Suter 1994	0	Sample and Suter 1994
Spotted sandpiper	0	0	0	0	0	82	EPA 1993a	18	Beyer et al. 1994
Mammals									
Norway rat	50	50	0	0	0	0	Linzey, 1998; estimated based on description of diet	2.0	Beyer et al. 1994; value is for deer mouse
Indian mongoose	11	68	2.6	0	0	3.2	Nellis 1989	13	Sample and Suter 1994; value is for short-tailed shrew

TABLE L-35
Assessment Endpoints, Risk Hypotheses, and Measurement Endpoints - Step 3
SWMU 6 Former NASD, Vieques Island, Puerto Rico

Assessment Endpoint	Risk Hypothesis	Measurement Endpoint	Receptor
Terrestrial Habitats			
Survival, growth, and reproduction of terrestrial soil invertebrate communities	Are site-related chemical concentrations in surface soil sufficient to adversely effect soil invertebrate communities?	Comparison of mean chemical concentrations in surface soil with soil screening values.	Soil invertebrates
Survival, growth, and reproduction of terrestrial plant communities	Are site-related chemical concentrations in surface soil sufficient to adversely effect terrestrial plant communities?	Comparison of mean chemical concentrations in surface soil with soil screening values.	Terrestrial plants
Survival, growth, and reproduction of terrestrial reptile populations	Are site-related chemical concentrations in surface soil sufficient to cause adverse effects (on growth, survival, or reproduction) to terrestrial reptile populations?	Evidence of potential risk to other upper trophic level terrestrial receptors evaluated in the ERA.	--
Survival, growth, and reproduction of avian terrestrial invertivore/omnivore populations	Are site-related chemical concentrations in surface soil sufficient to cause adverse effects (on growth, survival, or reproduction) to avian receptor populations that may consume terrestrial plants and soil invertebrates from the site?	Comparison of literature-derived chronic No Observed Adverse Effect Level (NOAEL) and Lowest Observed Adverse Effect Level (LOAEL) values for survival, growth, and/or reproductive effects with modeled dietary exposure doses based on mean surface soil concentrations.	Pearly-eyed thrasher
Survival, growth, and reproduction of avian terrestrial carnivore populations	Are site-related chemical concentrations in surface soil sufficient to cause adverse effects (on growth, survival, or reproduction) to avian receptor populations that may consume small mammals from the site?	Comparison of literature-derived chronic No Observed Adverse Effect Level (NOAEL) and Lowest Observed Adverse Effect Level (LOAEL) values for survival, growth, and/or reproductive effects with modeled dietary exposure doses based on mean surface soil concentrations.	Red-tailed hawk

TABLE L-35
Assessment Endpoints, Risk Hypotheses, and Measurement Endpoints - Step 3
SWMU 6 Former NASD, Vieques Island, Puerto Rico

Assessment Endpoint	Risk Hypothesis	Measurement Endpoint	Receptor
Survival, growth, and reproduction of mammalian terrestrial omnivore populations	Are site-related chemical concentrations in surface soil sufficient to cause adverse effects (on growth, survival, or reproduction) to mammalian receptor populations that may consume terrestrial plants and soil invertebrates from the site?	Comparison of literature-derived chronic No Observed Adverse Effect Level (NOAEL) and Lowest Observed Adverse Effect Level (LOAEL) values for survival, growth, and/or reproductive effects with modeled dietary exposure doses based on mean surface soil concentrations.	Norway rat
Survival, growth, and reproduction of mammalian terrestrial omnivore populations	Are site-related chemical concentrations in surface soil sufficient to cause adverse effects (on growth, survival, or reproduction) to mammalian receptor populations that may consume vegetation and small mammals from the site?	Comparison of literature-derived chronic No Observed Adverse Effect Level (NOAEL) and Lowest Observed Adverse Effect Level (LOAEL) values for survival, growth, and/or reproductive effects with modeled dietary exposure doses based on mean surface soil concentrations.	Indian mongoose
Aquatic Habitats			
Survival, growth, and reproduction of benthic invertebrate communities	Are site-related chemical concentrations in sediment sufficient to adversely effect benthic invertebrate communities?	Comparison of mean chemical concentrations in sediment with medium-specific screening values.	Benthic invertebrates
Survival, growth, and reproduction of fish communities	Are site-related chemical concentrations in sediment sufficient to adversely effect fish communities?	Comparison of mean chemical concentrations in sediment with medium-specific screening values.	Fish
Survival, growth, and reproduction of avian aquatic/wetland invertivore populations	Are site-related chemical concentrations in sediment sufficient to cause adverse effects (on growth, survival, or reproduction) to avian receptor populations that may consume primarily invertebrates from the site?	Comparison of literature-derived chronic No Observed Adverse Effect Level (NOAEL) and Lowest Observed Adverse Effect Level (LOAEL) values for survival, growth, and/or reproductive effects with modeled dietary exposure doses based on mean sediment concentrations.	Spotted sandpiper
Survival, growth, and reproduction of avian aquatic/wetland piscivore populations	Are site-related chemical concentrations in sediment sufficient to cause adverse effects (on growth, survival, or reproduction) to avian receptor populations that may consume primarily fish from the site?	Comparison of literature-derived chronic No Observed Adverse Effect Level (NOAEL) and Lowest Observed Adverse Effect Level (LOAEL) values for survival, growth, and/or reproductive effects with modeled dietary exposure doses based on mean sediment concentrations.	Green heron

TABLE L-36
Step 3 Screening Statistics - SWMU 6 - Surface Soil
SWMU 6 Former NASD, Vieques Island, Puerto Rico

Chemical	Frequency of Detection	Maximum Concentration Detected	Sample ID of Maximum Concentration	Arithmetic Mean	Screening Value	Frequency of Exceedance	Maximum Hazard Quotient	Mean Hazard Quotient
Inorganics (MG/KG)								
ALUMINUM	23 / 23	14000	NDA113	7100	50	23 / 23	280	142
ANTIMONY	19 / 23	13.3	NDA101	1.22	5	1 / 23	3	0.2
CHROMIUM, TOTAL	23 / 23	42.9	NDA113	13.1	0.4	23 / 23	107	33
COPPER	23 / 23	275	NDW06SS13-R01	57	50	5 / 23	6	1.1
IRON	23 / 23	93200	NDW06SS23-R01	18500	200	23 / 23	466	93
LEAD	23 / 23	617	NDA101	78.5	50	5 / 23	12	1.6
MANGANESE	23 / 23	741	NDW06SS23-R01	198	100	13 / 23	7	2.0
THALLIUM	3 / 23	4.3	NDA101	0.35	1	1 / 23	4	0.4
VANADIUM	23 / 23	71.4	NDW06SS21-R01	28.2	2	23 / 23	36	14
ZINC	23 / 23	438	NDA101	97.9	50	10 / 23	9	2.0
Pesticides/Polychlorinated Biphenyls (MG/KG)								
ALPHA-CHLORDANE	1 / 23	0.00061	NDA113	0.00313	NSV	-- / --	NSV	NSV
p,p'-DDD	7 / 23	0.028	NDW06SS13-R01	0.00722	0.0025	4 / 23	11	2.9
p,p'-DDE	12 / 23	0.074	NDA113	0.0134	0.0025	9 / 23	30	5.4
p,p'-DDT	5 / 23	0.017	NDA113	0.00754	0.0025	5 / 23	6.8	3.0
Semi-volatile Organic Compounds (MG/KG)								
2-METHYLNAPHTHALENE	1 / 23	0.311	NDA111	0.262	NSV	-- / --	NSV	NSV
ACENAPHTHYLENE	1 / 23	0.0282	NDW06SS13-R01	0.254	NSV	-- / --	NSV	NSV
ANTHRACENE	2 / 23	0.902	NDA111	0.283	0.1	1 / 23	9	2.8
BENZO(a)PYRENE	7 / 23	1.51	NDA111	0.308	0.1	4 / 23	15	3.1
BENZO(b)FLUORANTHENE	8 / 23	1.8	NDA111	0.302	NSV	-- / --	NSV	NSV
BENZO(g,h,i)PERYLENE	7 / 23	1.16	NDW06SS13-R01	0.265	1	1 / 23	1	0.3
BENZO(k)FLUORANTHENE	7 / 23	1.23	NDA111	0.279	NSV	-- / --	NSV	NSV
bis(2-ETHYLHEXYL) PHTHALATE	2 / 23	1.4	NDA101	0.305	NSV	-- / --	NSV	NSV
CARBAZOLE	1 / 23	0.431	NDA111	0.268	NSV	-- / --	NSV	NSV
CHRYSENE	8 / 23	2	NDA111	0.306	NSV	-- / --	NSV	NSV
DIBENZ(a,h)ANTHRACENE	3 / 23	0.345	NDW06SS13-R01	0.258	NSV	-- / --	NSV	NSV
DIBENZOFURAN	1 / 23	0.784	NDA111	0.283	NSV	-- / --	NSV	NSV
FLUORANTHENE	7 / 23	4.06	NDA111	0.394	0.1	4 / 23	41	3.9
INDENO(1,2,3-c,d)PYRENE	6 / 23	1.13	NDW06SS13-R01	0.286	NSV	-- / --	NSV	NSV
NAPHTHALENE	1 / 23	0.621	NDA111	0.276	0.1	1 / 23	6	2.8
PHENANTHRENE	4 / 23	4.86	NDA111	0.446	0.1	2 / 23	49	4.5
PYRENE	9 / 23	2.9	NDA111	0.344	0.1	4 / 23	29	3.4
Total PAHs	9 / 23	25.8	NDA111	5.660	1	9 / 23	26	5.7
Volatile Organic Compounds (MG/KG)								
ACETONE	1 / 15	1.33	NDW06SS14-R01	0.0959	NSV	-- / --	NSV	NSV
CARBON DISULFIDE	5 / 23	0.002	NDA101, NDA103	0.0057	NSV	-- / --	NSV	NSV
M,P-XYLENE (SUM OF ISOMERS)	2 / 8	0.004	NDA117	0.00484	NSV	-- / --	NSV	NSV
METHYL ETHYL KETONE (2-BUTANONE)	1 / 16	0.003	NDA101	0.00757	NSV	-- / --	NSV	NSV
METHYLENE CHLORIDE	3 / 23	0.0015	NDW06SS16-R01	0.00621	NSV	-- / --	NSV	NSV
O-XYLENE (1,2-DIMETHYLBENZENE)	1 / 8	0.002	NDA117	0.00538	NSV	-- / --	NSV	NSV

TABLE L-37
Step 3 Screening Statistics - SWMU 6 - Surface Water
SWMU 6 Former NASD, Vieques Island, Puerto Rico

Chemical	Frequency of Detection	Maximum Concentration Detected	Sample ID of Maximum Concentration	Arithmetic Mean	Screening Value	Frequency of Exceedance	Maximum Hazard Quotient	Mean Hazard Quotient
Inorganics (UG/L)								
ALUMINUM	12 / 14	2970	NDA301	1490	NSV	-- / --	NSV	NSV
ARSENIC	3 / 14	5.3	NDA300	11.7	1.4	3 / 14	3.8	8.4
BARIUM	13 / 14	15.1	NDA301	12	NSV	-- / --	NSV	NSV
COBALT	2 / 14	1.1	NDA037	3.07	NSV	-- / --	NSV	NSV
COPPER	7 / 14	38.9	NDW06SW07-R01	9.91	3.7	4 / 14	10.5	2.7
IRON	7 / 14	1410	NDA301	529	NSV	-- / --	NSV	NSV
LEAD	4 / 14	14.7	NDA300	10.3	8.1	1 / 14	1.8	1.3
MANGANESE	13 / 14	42	NDW06SW07-R01	21.4	NSV	-- / --	NSV	NSV
MANGANESE, DISSOLVED	4 / 7	24.5	NDW06SW08-R01	9.71	NSV	-- / --	NSV	NSV
MERCURY	7 / 8	1.6	NDA037	0.215	0.051	1 / 8	31.4	4.2
NICKEL, DISSOLVED	1 / 7	52	NDW06SW02-R01	16	8.2	1 / 7	6.3	2.0
SILVER	1 / 14	7.1	NDA040	3.4	1.9	1 / 14	3.7	1.8
THALLIUM	1 / 14	4.9	NDA036	13.6	NSV	-- / --	NSV	NSV
VANADIUM	7 / 14	5.8	NDA301	4.19	NSV	-- / --	NSV	NSV
Semi-volatile Organic Compounds (UG/L)								
DI-n-OCTYLPHTHALATE	1 / 14	6	NDW06SW09-R01	4.27	NSV	-- / --	NSV	NSV

TABLE L-38
Step 3 Screening Statistics - SWMU 6 - Sediment
SWMU 6 Former NASD, Vieques Island, Puerto Rico

Chemical	Frequency of Detection	Maximum Concentration Detected	Sample ID of Maximum Concentration	Arithmetic Mean	Screening Value	Frequency of Exceedance	Maximum Hazard Quotient	Mean Hazard Quotient
Inorganics (MG/KG)								
ALUMINUM	19 / 19	19300	NDA044	8770	NSV	-- / --	NSV	NSV
ANTIMONY	15 / 19	97.8	NDA043	5.67	12	1 / 19	8.15	0.5
ARSENIC	19 / 19	555	NDA043	33.2	7.24	3 / 19	76.66	4.6
BARIUM	19 / 19	571	NDA043	39	20	1 / 19	28.55	2.0
BERYLLIUM	19 / 19	14.2	NDA043	0.933	NSV	-- / --	NSV	NSV
CADMIUM	12 / 19	13.7	NDA043	0.815	1.2	1 / 19	11.42	0.7
COBALT	19 / 19	142	NDA043	12.2	NSV	-- / --	NSV	NSV
COPPER	19 / 19	101	NDA043	30	18.7	12 / 19	5.40	1.6
IRON	19 / 19	25700	NDA044	14200	NSV	-- / --	NSV	NSV
LEAD	19 / 19	144	NDA043	19.9	30.2	2 / 19	4.77	0.7
MANGANESE	19 / 19	388	NDW06SD08-R01	168	NSV	-- / --	NSV	NSV
MERCURY	14 / 19	0.21	NDA043	0.0519	0.13	2 / 19	1.62	0.4
NICKEL	19 / 19	143	NDA043	11.8	15.9	1 / 19	8.99	0.7
SELENIUM	14 / 19	544	NDA043	29.4	NSV	-- / --	NSV	NSV
SILVER	4 / 19	14.5	NDA043	0.814	2	1 / 19	7.25	0.4
THALLIUM	5 / 19	572	NDA043	30.5	NSV	-- / --	NSV	NSV
VANADIUM	19 / 19	174	NDA043	35.5	NSV	-- / --	NSV	NSV
ZINC	14 / 14	241	NDW06SD10-R01	67	124	2 / 14	1.94	0.5
Pesticides/Polychlorinated Biphenyls (MG/KG)								
p,p'-DDD	6 / 18	0.67	NDW06SD13-R01	0.0433	0.0033	2 / 18	203.03	13.1
p,p'-DDE	5 / 17	0.41	NDW06SD13-R01	0.0309	0.0033	3 / 17	124.24	9.4
p,p'-DDT	3 / 18	0.0086	NDW06SD05-R01	0.00419	0.0033	1 / 18	2.61	1.3
Semi-volatile Organic Compounds (MG/KG)								
bis(2-ETHYLHEXYL) PHTHALATE	6 / 19	0.446	NDW06SD05-R01	0.446	0.182	2 / 19	2.45	2.5
Volatile Organic Compounds (MG/KG)								
ACETONE	3 / 12	0.604	NDW06SD14-R01	0.14	NSV	-- / --	NSV	NSV
CARBON DISULFIDE	12 / 19	0.022	NDA044	0.00972	NSV	-- / --	NSV	NSV
ETHYLBENZENE	3 / 19	0.002	NDA046	0.0108	NSV	-- / --	NSV	NSV
M,P-XYLENE (SUM OF ISOMERS)	5 / 7	0.013	NDA044	0.00783	NSV	-- / --	NSV	NSV
METHYL ETHYL KETONE (2-BUTANONE)	5 / 17	0.017	NDA044	0.0132	NSV	-- / --	NSV	NSV
METHYLENE CHLORIDE	12 / 19	0.0082	NDW06SD07-R01	0.00796	NSV	-- / --	NSV	NSV
O-XYLENE (1,2-DIMETHYLBENZENE)	4 / 7	0.003	NDA044, NDA046	0.00493	NSV	-- / --	NSV	NSV
TOLUENE	4 / 19	0.003	NDA045, NDA303, NDA046, NDA044	0.0111	NSV	-- / --	NSV	NSV

TABLE L-39
Summary of Hazard Quotients for Upper Trophic Level Receptors - Step 3
SWMU 6 Former NASD, Vieques Island, Puerto Rico

	Terrestrial								Aquatic			
	Norway rat		Indian mongoose		Pearly-eyed thrasher		Red-tailed hawk		Spotted sandpiper		Green heron	
Chemical	NOAEL	LOAEL	NOAEL	LOAEL	NOAEL	LOAEL	NOAEL	LOAEL	NOAEL	LOAEL	NOAEL	LOAEL
Inorganics												
Arsenic	0.05	<0.01	<0.01	<0.01	0.02	<0.01	<0.01	<0.01	0.65	0.26	0.28	0.11
Cadmium	0.04	<0.01	0.02	<0.01	0.13	<0.01	<0.01	<0.01	0.07	<0.01	0.03	<0.01
Chromium	0.04	<0.01	0.01	<0.01	0.51	0.10	<0.01	<0.01	0.61	0.12	0.13	0.03
Copper	0.01	<0.01	0.02	0.02	0.07	0.05	<0.01	<0.01	0.11	0.08	0.04	0.03
Lead	0.08	<0.01	0.05	<0.01	0.95	0.19	<0.01	<0.01	0.23	0.05	0.07	0.01
Mercury	0.03	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.38	0.13	*1.00*	0.33
Selenium	0.03	0.02	0.05	0.03	0.04	0.01	<0.01	<0.01	**13.11**	**6.55**	**3.12**	0.62
Zinc	0.04	0.02	0.09	0.02	**1.76**	0.20	<0.01	<0.01	0.79	0.09	0.34	0.04
Pesticides/PCBs												
4,4'-DDD	--	--	--	--	--	--	--	--	0.02	<0.01	0.05	<0.01
4,4'-DDE	--	--	--	--	--	--	--	--	0.08	0.02	0.38	0.04
Aroclor-1016	0.04	<0.01	<0.01	<0.01	0.06	0.01	<0.01	<0.01	--	--	--	--
Aroclor-1221	0.09	0.02	0.03	<0.01	0.13	0.03	<0.01	<0.01	0.02	<0.01	0.10	0.02
Aroclor-1232	0.04	<0.01	0.01	<0.01	0.06	0.01	<0.01	<0.01	--	--	--	--
Aroclor-1242	0.04	<0.01	0.01	<0.01	0.06	0.01	<0.01	<0.01	--	--	--	--
Aroclor-1248	0.04	<0.01	0.01	<0.01	0.06	0.01	<0.01	<0.01	--	--	--	--
Aroclor-1260	0.04	<0.01	0.01	<0.01	0.06	0.01	<0.01	<0.01	--	--	--	--
Dieldrin	0.03	<0.01	0.01	<0.01	0.06	0.01	<0.01	<0.01	0.06	0.01	0.03	<0.01
Endrin	<0.01	<0.01	<0.01	<0.01	0.11	0.02	<0.01	<0.01	--	--	--	--
Toxaphene	--	--	--	--	--	--	--	--	0.06	0.01	0.07	0.01
Semivolatile Organics												
Hexachlorobenzene	0.01	<0.01	<0.01	<0.01	0.40	0.08	<0.01	<0.01	0.45	0.09	0.66	0.13

TABLE L-40
Comparison of PCOC Surface Soil Concentrations to Background Concentrations
SWMU 6 Former NASD, Vieques Island, Puerto Rico

Chemical	SWMU 6 Surface Soil (mg/kg)			Background Upper Tolerance Limit (UTL)	Frequency of UTL Exceedance	Maximum Ratio of Site Soils to Background UTL
	Frequency of Detection	Maximum Detected Concentration	Arithmetic Mean			
Inorganics (MG/KG)						
CHROMIUM, TOTAL	23 / 23	43	13	74	0 / 23	0.58
COPPER	23 / 23	275	57	68	5 / 23	4.04
IRON	23 / 23	93,200	18,500	37,531	2 / 23	2.48
LEAD	23 / 23	617	79	7	15 / 23	89.42
MANGANESE	23 / 23	741	198	1,167	0 / 23	0.63
VANADIUM	23 / 23	71	28	130	0 / 23	0.55
ZINC	23 / 23	438	98	65	10 / 23	6.74

TABLE L-41
Comparison of PCOC Surface Water Concentrations to Upgradient Concentrations
SWMU 6 Former NASD, Vieques Island, Puerto Rico

Chemical	SWMU 6 Surface Water (ug/L)			Maximum Upgradient Concentration	Mean Upgradient Concentration	Ratio of Maximums	Ratio of Maximums
	Frequency of Detection	Maximum Detected Concentration	Arithmetic Mean				
Inorganics (UG/L)							
ALUMINUM	12 / 14	2,970	1,490	700 U	700 U	--	--
ARSENIC	3 / 14	5.3	11.7	40.8 UJ	40.8 UJ	--	--
BARIUM	13 / 14	15.1	12.0	14.9	13	1.0	0.9
COBALT	2 / 14	1.1	3.1	11.4 U	11.4 U	--	--
COPPER	7 / 14	39	10	23.4 U	23.4 U	--	--
IRON	7 / 14	1,410	529	334 U	334 U	--	--
LEAD	4 / 14	15	10	35.2 UJ	35.2 UJ	--	--
MANGANESE	13 / 14	42	21	13	10.8	3.2	2.0
MANGANESE, DISSOLVED	4 / 7	25	10	7	5.4	3.5	1.8
MERCURY	7 / 8	1.60	0.215	0.04	0.0317	40.0	6.8
NICKEL, DISSOLVED	1 / 7	52	16	19.9 U	19.9 U	--	--
SILVER	1 / 14	7.1	3.4	9.44 U	9.44 U	--	--
THALLIUM	1 / 14	4.9	14	50.8 UJ	50.8 UJ	--	--
VANADIUM	7 / 14	5.8	4.2	8.94 U	8.94 U	--	--
Semi-volatile Organic Compounds (UG/L)							
DI-n-OCTYLPHTHALATE	1 / 14	6.0	4.3	5.2 U	5.1U	--	--

TABLE L-42
Comparison of PCOC Sediment Concentrations to Upgradient Concentrations
SWMU 6 Former NASD, Vieques Island, Puerto Rico

Chemical	SWMU 6 Sediment (mg/kg)			Maximum Upgradient Concentration	Mean Upgradient Concentration	Ratio of Maximums	Ratio of Means
	Frequency of Detection	Maximum Detected Concentration	Arithmetic Mean				
Inorganics (MG/KG)							
ALUMINUM	19 / 19	19300	8770	4,520	3,235	4.3	2.7
ARSENIC	19 / 19	555	33.2	1.49	1.10	372.5	30.2
BARIUM	19 / 19	571	39	4.24	4.06	134.7	9.6
BERYLLIUM	19 / 19	14.2	0.933	0.12	0.09	114.5	10.4
COBALT	19 / 19	142	12.2	2.35	1.81	60.4	6.8
COPPER	19 / 19	101	30	10.60	8.43	9.5	3.6
IRON	19 / 19	25700	14200	5,620	4,630	4.6	3.1
MANGANESE	19 / 19	388	168	67.0	60.2	5.8	2.8
SELENIUM	14 / 19	544	29.4	0.595	0.411	914.3	71.6
THALLIUM	5 / 19	572	30.5	0.284	0.21	2014.1	145.2
VANADIUM	19 / 19	174	35.5	20.10	14.16	8.7	2.5
Pesticides/Polychlorinated Biphenyls (MG/KG)							
p,p'-DDD	6 / 18	0.67	0.0433	0.0011	0.0026	609.1	16.7
p,p'-DDE	5 / 17	0.41	0.0309	0.0028	0.0035	146.4	9.0
p,p'-DDT	3 / 18	0.0086	0.00419	0.0082 U	0.0081 U	--	--
Semi-volatile Organic Compounds (MG/KG)							
bis(2-ETHYLHEXYL) PHTHALATE	6 / 19	0.446	0.446	0.816 U	0.808 U	--	--
Volatile Organic Compounds (MG/KG)							
ACETONE	3 / 12	0.604	0.14	0.04 UJ	0.019 U	--	--
CARBON DISULFIDE	12 / 19	0.022	0.00972	0.04 UJ	0.019 U	--	--
ETHYLBENZENE	3 / 19	0.002	0.0108	0.04 UJ	0.019 U	--	--
M,P-XYLENE (SUM OF ISOMERS)	5 / 7	0.013	0.00783	0.04 UJ	0.019 U	--	--
METHYL ETHYL KETONE (2-BUTANONE)	5 / 17	0.017	0.0132	0.04 UJ	0.019 U	--	--
METHYLENE CHLORIDE	12 / 19	0.0082	0.00796	0.04 UJ	0.019 U	--	--
O-XYLENE (1,2-DIMETHYLBENZENE)	4 / 7	0.003	0.00493	0.04 UJ	0.019 U	--	--
TOLUENE	4 / 19	0.003	0.0111	0.04 UJ	0.019 U	--	--

ATTACHMENT 1

TABLE 1

SELECTION OF EXPOSURE PATHWAYS

SWMU 6 - Mangrove Disposal Site

NASD, Vieques Island, Puerto Rico

Scenario Timeframe	Medium	Exposure Medium	Exposure Point	Receptor Population	Receptor Age	Exposure Route	On-Site/ Off-Site	Type of Analysis	Rationale for Selection or Exclusion of Exposure Pathway
Current/Future	Surface Soil	Surface Soil	SWMU 6 Surface Soil	Recreational	Adult	Dermal Absorption	On-site	Quant	Nearby residents may trespass on site and contact surface soil.
						Ingestion	On-site	Quant	Nearby residents may trespass on site and contact surface soil.
					Youth	Dermal Absorption	On-site	Quant	Nearby residents may trespass on site and contact surface soil.
						Ingestion	On-site	Quant	Nearby residents may trespass on site and contact surface soil.
					Child	Dermal Absorption	On-site	Quant	Nearby residents may trespass on site and contact surface soil.
						Ingestion	On-site	Quant	Nearby residents may trespass on site and contact surface soil.
		Air	Emissions from SWMU 6 Surface Soil	Recreational	Adult	Inhalation	On-site	Quant	Nearby residents may trespass on site and inhale dust from surface soil.
					Youth	Inhalation	On-site	Quant	Nearby residents may trespass on site and inhale dust from surface soil.
					Child	Inhalation	On-site	Quant	Nearby residents may trespass on site and inhale dust from surface soil.
	Sediment	Sediment	Kiani Lagoon	Recreational	Adult	Dermal	On-site	Quant	Nearby residents may trespass on site and contact sediment.
						Ingestion	On-site	Quant	Nearby residents may trespass on site and contact sediment.
					Youth	Dermal	On-site	Quant	Nearby residents may trespass on site and contact sediment.
						Ingestion	On-site	Quant	Nearby residents may trespass on site and contact sediment.
					Child	Dermal	On-site	Quant	Nearby residents may trespass on site and contact sediment.
						Ingestion	On-site	Quant	Nearby residents may trespass on site and contact sediment.
	Surface Water	Surface Water	Kiani Lagoon	Recreational	Adult	Dermal	On-site	Quant	Nearby residents may trespass on site and contact surface water.
						Ingestion	On-site	Quant	Nearby residents may trespass on site and contact surface water.
					Youth	Dermal	On-site	Quant	Nearby residents may trespass on site and contact surface water.
						Ingestion	On-site	Quant	Nearby residents may trespass on site and contact surface water.
					Child	Dermal	On-site	Quant	Nearby residents may trespass on site and contact surface water.
						Ingestion	On-site	Quant	Nearby residents may trespass on site and contact surface water.
Future	Surface Soil	Surface Soil	SWMU 6 Surface Soil	Residential	Adult	Dermal Absorption	On-site	Quant	The site is not expected to be developed for residential use; however, the residential scenario is conservatively included in this evaluation.
						Ingestion	On-site	Quant	The site is not expected to be developed for residential use; however, the residential scenario is conservatively included in this evaluation.
					Child	Dermal Absorption	On-site	Quant	The site is not expected to be developed for residential use; however, the residential scenario is conservatively included in this evaluation.
						Ingestion	On-site	Quant	The site is not expected to be developed for residential use; however, the residential scenario is conservatively included in this evaluation.
				Maintenance Worker	Adult	Dermal	On-site	Quant	The site is located on steep slope and wooded and is assumed to have some maintenance activity.
						Ingestion	On-site	Quant	The site is located on steep slope and wooded and is assumed to have some maintenance activity.
				Industrial Worker	Adult	Dermal	On-site	Quant	Industrial workers may be present at this site in the future and contact surface soil.
						Ingestion	On-site	Quant	Industrial workers may be present at this site in the future and contact surface soil.

TABLE 1

SELECTION OF EXPOSURE PATHWAYS

SWMU 6 - Mangrove Disposal Site

NASD, Vieques Island, Puerto Rico

Scenario Timeframe	Medium	Exposure Medium	Exposure Point	Receptor Population	Receptor Age	Exposure Route	On-Site/ Off-Site	Type of Analysis	Rationale for Selection or Exclusion of Exposure Pathway
Future (cont.)	Surface Soil	Air	Emissions from SWMU 6 Surface Soil	Residential	Adult	Inhalation	On-site	Quant	The site is not expected to be developed for residential use; however, the residential scenario is conservatively included in this evaluation.
					Child	Inhalation	On-site	Quant	The site is not expected to be developed for residential use; however, the residential scenario is conservatively included in this evaluation.
				Maintenance Worker	Adult	Inhalation	On-site	Quant	The site is located on steep slope and wooded and is assumed to have some maintenance activity. Workers may inhale dust from surface soil.
				Industrial Worker	Adult	Inhalation	On-site	Quant	Industrial workers may be present at this site in the future and may inhale vapors or fugitive dust from soil.
	Subsurface Soil	Subsurface Soil	SWMU 6 Subsurface Soil	Residential	Adult	Dermal Absorption	On-site	Quant	The site is not expected to be developed for residential use; however, the residential scenario is conservatively included in this evaluation.
						Ingestion	On-site	Quant	The site is not expected to be developed for residential use; however, the residential scenario is conservatively included in this evaluation.
					Child	Dermal Absorption	On-site	Quant	The site is not expected to be developed for residential use; however, the residential scenario is conservatively included in this evaluation.
						Ingestion	On-site	Quant	The site is not expected to be developed for residential use; however, the residential scenario is conservatively included in this evaluation.
				Construction Worker	Adult	Dermal	On-site	Quant	Utility workers could contact subsurface soil while performing activities at the site.
						Ingestion	On-site	Quant	Utility workers could contact subsurface soil while performing activities at the site.
		Air	Emissions from SWMU 6 Subsurface Soil	Residential	Adult	Inhalation	On-site	Quant	The site is not expected to be developed for residential use; however, the residential scenario is conservatively included in this evaluation.
					Child	Inhalation	On-site	Quant	The site is not expected to be developed for residential use; however, the residential scenario is conservatively included in this evaluation.
				Construction Worker	Adult	Inhalation	On-site	Quant	Utility workers could inhale dust from subsurface soil.
	Groundwater	Groundwater	Tap Water	Residential	Adult	Ingestion	On-site	Quant	Although unlikely, groundwater may be used as future potable water supply.
						Dermal Absorption	On-site	Quant	Although unlikely, groundwater may be used as future potable water supply. The adult is assumed to shower, and the child is assumed to bathe.
						Inhalation	On-site	None	VOCs were not detected in site groundwater. Therefore inhalation pathway is incomplete.
					Child	Ingestion	On-site	Quant	Although unlikely, groundwater may be used as future potable water supply.
						Dermal Absorption	On-site	Quant	Although unlikely, groundwater may be used as future potable water supply.
						Inhalation	On-site	None	VOCs were not detected in site groundwater. Therefore inhalation pathway is incomplete.
				Industrial Worker	Adult	Dermal	On-site	Quant	Industrial workers may be present at this site in the future and contact groundwater.
						Ingestion	On-site	Quant	Industrial workers may be present at this site in the future and contact groundwater.
						Inhalation	On-site	None	VOCs were not detected in site groundwater. Therefore inhalation pathway is incomplete.
	Sediment	Sediment	Kiani Lagoon	Residential	Child	Dermal	On-site	Quant	Nearby residents may trespass on site and contact sediment.
						Ingestion	On-site	Quant	Nearby residents may trespass on site and contact sediment.
	Surface Water	Surface Water	Kiani Lagoon	Residential	Child	Dermal	On-site	Quant	Nearby residents may trespass on site and contact surface water.
						Ingestion	On-site	Quant	Nearby residents may trespass on site and contact surface water.

Table 2.1

OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN

SWMU 6 - Mangrove Disposal Site

NASD, Vieques Island, Puerto Rico

Scenario Timeframe: Current/Future
Medium: Surface Soil
Exposure Medium: Surface Soil

Exposure Point	CAS Number	Chemical	Minimum [1] Concentration Qualifier	Maximum [1] Concentration Qualifier	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration [2] Used for Screening	Background [3] Value	Screening [4] Toxicity Value	Potential ARAR/TBC Value	Potential ARAR/TBC Source	COPC Flag	Rationale for [5] Contaminant Deletion or Selection
SWMU 6 Surface Soil	67-64-1	ACETONE	1.33E+00 J	1.33E+00 J	MG/KG	NDW06SS14	1/15	0.004 - 0.659	1.33E+00	NA	1.57E+02 NC	8.00E+00	SSL	NO	BSL
	75-15-0	CARBON DISULFIDE	7.00E-04 J	2.00E-03 J	MG/KG	W6-SB01, W6-SB02	5/23	0.00024 - 0.0011	2.00E-03	NA	3.55E+01 NC	2.00E+01	SSL	NO	BSL
	100-41-4	ETHYLBENZENE	1.00E-03 J	1.00E-03 J	MG/KG	W6-SB08	1/23	0.00022 - 0.00084	1.00E-03	NA	8.92E+00 CA	7.00E+00	SSL	NO	BSL
	108-38-3/106-42	M,P-XYLENE (SUM OF ISOMERS)	7.00E-04 J	4.00E-03 J	MG/KG	W6-SB08	2/8	0.00016 - 0.00022	4.00E-03	NA	2.75E+01 NC	1.00E+02	SSL	NO	BSL
	78-93-3	METHYL ETHYL KETONE (2-BUTANONE)	3.00E-03 J	3.00E-03 J	MG/KG	W6-SB01	1/16	0.0012 - 0.0024	3.00E-03	NA	7.33E+02 NC	NA	SSL	NO	BSL
	75-09-2	METHYLENE CHLORIDE	6.50E-04 J	1.50E-03 J	MG/KG	NDW06SS16	3/23	0.00052 - 0.00222	1.50E-03	NA	9.11E+00 CA	1.00E-02	SSL	NO	BSL
	95-47-6	O-XYLENE (1,2-DIMETHYLBENZENE)	2.00E-03 J	2.00E-03 J	MG/KG	W6-SB08	1/8	0.00016 - 0.00022	2.00E-03	NA	2.75E+01 NC	1.00E+02	SSL	NO	BSL
	108-88-3	TOLUENE	8.00E-04 J	8.00E-04 J	MG/KG	W6-SB08	1/23	0.00022 - 0.0008	8.00E-04	NA	5.20E+02 SAT	6.00E+00	SSL	NO	BSL
	1330-20-7	XYLENES, TOTAL	7.00E-04 J	6.00E-03 J	MG/KG	W6-SB08	2/23	0.00016 - 0.0022	6.00E-03	NA	2.75E+01 NC	1.00E+02	SSL	NO	BSL
	91-57-6	2-METHYLNAPHTHALENE	3.11E-01 J	3.11E-01 J	MG/KG	W6-SB05	1/23	0.02286 - 0.0489	3.11E-01	NA	3.82E+02 NC	NA	SSL	NO	BSL
	83-32-9	ACENAPHTHENE	6.84E-01	6.84E-01	MG/KG	W6-SB05	1/23	0.01905 - 0.0344	6.84E-01	NA	3.68E+02 NC	2.90E+02	SSL	NO	BSL
	208-96-8	ACENAPHTHYLENE	2.82E-02 J	2.82E-02 J	MG/KG	NDW06SS13	1/23	0.0277 - 0.0604	2.82E-02	NA	5.59E+00 NC	4.00E+01	SSL	NO	BSL
	120-12-7	ANTHRACENE	8.45E-02 J	9.02E-01	MG/KG	W6-SB05	2/23	0.02134 - 0.038	9.02E-01	NA	2.19E+03 NC	5.90E+03	SSL	NO	BSL
	56-55-3	BENZO(a)ANTHRACENE	4.10E-02 J	1.87E+00	MG/KG	W6-SB05	5/23	0.01981 - 0.0471	1.87E+00	NA	6.21E-01 CA	8.00E-01	SSL	YES	ASL
	50-32-8	BENZO(a)PYRENE	4.17E-02 J	1.51E+00	MG/KG	W6-SB05	7/23	0.02591 - 0.04053	1.51E+00	NA	6.21E-02 CA	4.00E+00	SSL	YES	ASL
	205-99-2	BENZO(b)FLUORANTHENE	2.87E-02 J	1.80E+00	MG/KG	W6-SB05	8/23	0.0202 - 0.03576	1.80E+00	NA	6.21E-01 CA	2.00E+00	SSL	YES	ASL
	191-24-2	BENZO(g,h,i)PERYLENE	4.00E-02 J	1.16E+00	MG/KG	NDW06SS13	7/23	0.02286 - 0.03656	1.16E+00	NA	2.32E+02 NC	2.10E+03	SSL	NO	BSL
	207-08-9	BENZO(k)FLUORANTHENE	4.17E-02 J	1.23E+00	MG/KG	W6-SB05	7/23	0.0214 - 0.04291	1.23E+00	NA	6.21E+00 CA	2.00E+01	SSL	NO	BSL
	117-81-7	bis(2-ETHYLHEXYL) PHTHALATE	1.35E-01 J	1.40E+00	MG/KG	W6-SB01	2/23	0.02896 - 0.0561	1.40E+00	NA	3.47E+01 CA*	NA	SSL	NO	BSL
	86-74-8	CARBAZOLE	4.31E-01 J	4.31E-01 J	MG/KG	W6-SB05	1/23	0.02439 - 0.0543	4.31E-01	NA	2.43E+01 CA	3.00E-01	SSL	NO	BSL
	218-01-9	CHRYSENE	3.58E-02 J	2.00E+00	MG/KG	W6-SB05	8/23	0.0221 - 0.0362	2.00E+00	NA	6.21E+01 CA	8.00E+01	SSL	NO	BSL
	53-70-3	DIBENZ(a,h)ANTHRACENE	5.17E-02 J	3.45E-01 J	MG/KG	NDW06SS13	3/23	0.02515 - 0.0525	3.45E-01	NA	6.21E-02 CA	8.00E-01	SSL	YES	ASL
	132-64-9	DIBENZOFURAN	7.84E-01	7.84E-01	MG/KG	W6-SB05	1/23	0.01981 - 0.0362	7.84E-01	NA	2.91E+01 NC	NA	SSL	NO	BSL
	206-44-0	FLUORANTHENE	3.22E-02 J	4.06E+00	MG/KG	W6-SB05	7/23	0.0227 - 0.03735	4.06E+00	NA	2.29E+02 NC	2.10E+03	SSL	NO	BSL
	86-73-7	FLUORENE	4.40E-01 J	4.40E-01 J	MG/KG	W6-SB05	1/23	0.02134 - 0.03417	4.40E-01	NA	2.75E+02 NC	2.80E+02	SSL	NO	BSL
	193-39-5	INDENO(1,2,3-c,d)PYRENE	5.00E-02 J	1.13E+00	MG/KG	NDW06SS13	6/23	0.01981 - 0.0616	1.13E+00	NA	6.21E-01 CA	7.00E+00	SSL	YES	ASL
	91-20-3	NAPHTHALENE	6.21E-01	6.21E-01	MG/KG	W6-SB05	1/23	0.0282 - 0.0525	6.21E-01	NA	5.59E+00 NC	4.00E+01	SSL	NO	BSL
	85-01-8	PHENANTHRENE	2.76E-02 J	4.86E+00	MG/KG	W6-SB05	4/23	0.0214 - 0.03497	4.86E+00	NA	2.32E+02 NC	2.10E+03	SSL	NO	BSL
	129-00-0	PYRENE	3.30E-02 J	2.90E+00	MG/KG	W6-SB05	9/23	0.02134 - 0.0398	2.90E+00	NA	2.32E+02 NC	2.10E+03	SSL	NO	BSL
	510-37-1	ALPHA-CHLORDANE	6.10E-04 J	6.10E-04 J	MG/KG	W6-SB06	1/23	0.00014 - 0.0019	6.10E-04	NA	1.62E+00 CA*	5.00E+00	SSL	NO	BSL
	742-19-3	ENDRIN ALDEHYDE	1.10E-02 J	1.10E-02 J	MG/KG	NDW06SS19	1/23	0.00022 - 0.003	1.10E-02	NA	1.83E+00 NC	5.00E-01	SSL	NO	BSL
	72-54-8	p,p'-DDD	6.20E-04 J	2.80E-02 J	MG/KG	NDW06SS13	7/23	0.00017 - 0.0022	2.80E-02	NA	2.44E+00 CA	8.00E+00	SSL	NO	BSL
	72-55-9	p,p'-DDE	3.70E-04 J	7.40E-02 J	MG/KG	W6-SB06	12/23	0.00007 - 0.00091	7.40E-02	NA	1.72E+00 CA	3.00E+01	SSL	NO	BSL
	50-29-3	p,p'-DDT	3.00E-03 J	1.70E-02 J	MG/KG	W6-SB06	5/23	0.00025 - 0.0032	1.70E-02	NA	1.72E+00 CA*	2.00E+01	SSL	NO	BSL
	11097-69-1	PCB-1254 (AROCHLOR 1254)	4.30E-02 J	4.30E-02 J	MG/KG	NDW06SS23	1/23	0.00053 - 0.02016	4.30E-02	NA	2.22E-01 CA**	NA	SSL	NO	BSL
	7429-90-5	ALUMINUM	3.47E+03	1.40E+04	MG/KG	W6-SB06	23/23	1.66 - 2.78	1.40E+04	NA	7.61E+03 NC	NA	SSL	YES	BSL
	7440-36-0	ANTIMONY	1.74E-01 J	1.33E+01 J	MG/KG	W6-SB01	19/23	0.106 - 0.178	1.33E+01	NA	3.13E+00 NC	3.00E+00	SSL	YES	BSL
	7440-38-2	ARSENIC	4.80E-01 J	7.90E+00 J	MG/KG	NDW06SS23	23/23	0.155 - 0.34	7.90E+00	NA	3.90E-01 NC	1.00E+00	SSL	YES	ASL
	7440-39-3	BARIUM	7.36E+00 J	3.76E+01 J	MG/KG	W6-SB08	23/23	0.01 - 0.0172	3.76E+01	NA	5.37E+02 NC	8.20E+02	SSL	NO	BSL
	7440-41-7	BERYLLIUM	3.00E-02 J	1.20E-01 J	MG/KG	W6-SB04, W6-SB06	21/23	0.0162 - 0.03	1.20E-01	NA	1.54E+01 NC	3.00E+01	SSL	NO	BSL
	7440-43-9	CADMIUM	2.80E-02 J	1.40E+00	MG/KG	W6-SB04	20/23	0.0142 - 0.0238	1.40E+00	NA	3.70E+00 NC	4.00E+00	SSL	NO	BSL
	7440-70-2	CALCIUM	3.54E+04 J	1.65E+05	MG/KG	NDW06SS20	23/23	1.21 - 23.3	1.65E+05	NA	NA	NA	SSL	NO	NUT

Table 2.1

OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN

SWMU 6 - Mangrove Disposal Site

NASD, Vieques Island, Puerto Rico

Scenario Timeframe: Current/Future
Medium: Surface Soil
Exposure Medium: Surface Soil

Exposure Point	CAS Number	Chemical	Minimum [1] Concentration Qualifier	Maximum [1] Concentration Qualifier	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration [2] Used for Screening	Background [3] Value	Screening [4] Toxicity Value	Potential ARAR/TBC Value	Potential ARAR/TBC Source	COPC Flag	Rationale for [5] Contaminant Deletion or Selection
	7440-47-3	CHROMIUM, TOTAL	3.07E+00	4.29E+01	MG/KG	W6-SB06	23/23	0.0455 - 0.0764	4.29E+01	NA	3.01E+01 CA**	2.00E+01	SSL	YES	ASL
	7440-48-4	COBALT	1.02E+00 J	1.28E+01	MG/KG	W6-SB06	23/23	0.0368 - 0.0618	1.28E+01	NA	9.03E+02 CA**	NA	SSL	NO	BSL
	7440-50-8	COPPER	5.21E+00 J	2.75E+02	MG/KG	NDW06SS13	23/23	0.0721 - 0.19	2.75E+02	NA	3.13E+02 NC	NA	SSL	NO	NUT
	7439-89-6	IRON	2.96E+03	9.32E+04	MG/KG	NDW06SS23	23/23	1.19 - 7.23	9.32E+04	NA	2.35E+03 NC	NA	SSL	YES	ASL
	7439-92-1	LEAD	3.58E+00 J	6.17E+02	MG/KG	W6-SB01	23/23	0.11 - 0.356	6.17E+02	NA	4.00E+01 NC	NA	SSL	YES	ASL
	7439-95-4	MAGNESIUM	1.81E+03 J	9.05E+03	MG/KG	W6-SB06	23/23	0.87 - 2.12	9.05E+03	NA	NA	NA	SSL	NO	NUT
	7439-96-5	MANGANESE	3.09E+01	7.41E+02	MG/KG	NDW06SS23	23/23	0.01 - 0.129	7.41E+02	NA	1.76E+02 NC	NA	SSL	YES	BSL
	7439-97-6	MERCURY	3.37E-03 J	8.10E-02 J	MG/KG	W6-SB01, W6-SB03	18/23	0.00141 - 0.01	8.10E-02	NA	6.11E-01 NC	NA	SSL	NO	BSL
	7440-02-0	NICKEL	1.10E+00 J	2.00E+01	MG/KG	W6-SB06	23/23	0.0625 - 0.105	2.00E+01	NA	1.56E+02 NC	7.00E+01	SSL	NO	BSL
	7440-09-7	POTASSIUM	1.28E+03 J	2.89E+03 J	MG/KG	NDW06SS16	23/23	2.62 - 5.21	2.89E+03	NA	NA	NA	SSL	NO	NUT
	7782-49-2	SELENIUM	3.91E-01 J	4.35E-01 J	MG/KG	NDW06SS14	2/23	0.21 - 0.373	4.35E-01	NA	3.91E+01 NC	3.00E+00	SSL	NO	BSL
	7440-22-4	SILVER	3.46E-02 J	4.10E-01 J	MG/KG	W6-SB06	9/23	0.0269 - 0.05	4.10E-01	NA	3.91E+01 NC	2.00E+01	SSL	NO	BSL
	7440-23-5	SODIUM	3.25E+03	1.42E+04	MG/KG	W6-SB05	23/23	1.76 - 11.54	1.42E+04	NA	NA	NA	SSL	NO	NUT
	7440-28-0	THALLIUM	7.70E-01 J	4.30E+00	MG/KG	W6-SB01	3/23	0.136 - 0.27	4.30E+00	NA	5.16E-01 NC	NA	SSL	YES	BSL
	7440-62-2	VANADIUM	9.84E+00 J	7.14E+01	MG/KG	NDW06SS21	23/23	0.0406 - 0.08	7.14E+01	NA	5.47E+01 NC	3.00E+03	SSL	YES	BSL
	7440-66-6	ZINC	1.26E+01	4.38E+02	MG/KG	W6-SB01	23/23	0.0722 - 0.25	4.38E+02	NA	2.35E+03 NC	6.20E+03	SSL	NO	BSL

[1] Minimum/Maximum detected concentrations.

[2] Maximum concentration is used for screening.

[3] Background values not available.

[4] EPA Region 9 PRGs Table, October 1, 2002, U.S. EPA Region 9.
PRG value for xylenes used as surrogate for m,p-xylene and o-xylene.
PRG value for 2-methylnaphthalene calculated using provisional reference dose and methods described in Region 9 PRGs Table Users Guide/Technical Background Document, October 1, 2002, U.S. EPA Region 9.
PRG value for pyrene used as surrogate for benzo(g,h,i)perylene and phenanthrene.
RBC value for naphthalene used as surrogate for acenaphthylene.
RBC value for chlordane used as surrogate for alpha-chlordane.
RBC value for aldehyde used as surrogate for endrin aldehyde.
PRG value for chromium VI used for total chromium.
PRG value for methyl mercury used as surrogate for mercury.
Lead screening toxicity value is 400 mg/kg, the EPA residential soil screening level for lead.

[5] Rationale Codes

Selection Reason: Above Screening Levels (ASL)

Deletion Reason: No Toxicity Information (NTX)
Essential Nutrient (NUT)
Below Screening Level (BSL)

SSL = Soil Screening Level; Dilution Attenuation Factor = 10 (USEPA, October 2002)
COPC = Chemical of Potential Concern
ARAR/TBC = Applicable or Relevant and Appropriate Requirement/ To Be Considered
J = Estimated Value
CA = Carcinogenic
NC = Noncarcinogenic
CA* (where: NC < 100X CA)
CA**(where: NC < 10X CA)
SAT = Soil Saturation

Table 2.2

OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN

SWMU 6 - Mangrove Disposal Site

NASD, Vieques Island, Puerto Rico

Scenario Timeframe: Current/Future
Medium: Subsurface Soil
Exposure Medium: Subsurface Soil

Exposure Point	CAS Number	Chemical	Minimum [1] Concentration Qualifier	Maximum [1] Concentration Qualifier	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration [2] Used for Screening	Background [3] Value	Screening [4] Toxicity Value	Potential ARAR/TBC Value	Potential ARAR/TBC Source	COPC Flag	Rationale for [5] Contaminant Deletion or Selection
SWMU 6 Subsurface Soil	71-43-2	BENZENE	2.00E-04 J	2.00E-04 J	MG/KG	W6-SB02, W6-SB05	2/8	0.00007 - 0.00012	2.00E-04	NA	1.31E+00 CA*	2.00E-02	SSL	NO	BSL
	75-15-0	CARBON DISULFIDE	1.00E-03 J	6.00E-03 J	MG/KG	W6-SB07,W6-SB08	6/8	0.00022 - 0.00032	6.00E-03	NA	7.20E+02 SAT	2.00E+01	SSL	NO	BSL
	100-41-4	ETHYLBENZENE	1.00E-03 J	1.00E-03 J	MG/KG	W6-SB02	1/8	0.00023 - 0.00029	1.00E-03	NA	1.95E+01 CA	7.00E+00	SSL	NO	BSL
	108-38-3/106-42	M,P-XYLENE (SUM OF ISOMERS)	6.00E-04 J	6.00E-04 J	MG/KG	W6-SB01	1/8	0.00015 - 0.00023	6.00E-04	NA	4.20E+02 SAT	1.00E+02	SSL	NO	BSL
	78-93-3	METHYL ETHYL KETONE (2-BUTANONE)	3.00E-03 J	3.00E-03 J	MG/KG	W6-SB01	1/1	0.00128 - 0.00128	3.00E-03	NA	2.71E+03 NC	NA	NA	NO	BSL
	95-47-6	O-XYLENE (1,2-DIMETHYLBENZENE)	2.00E-03 J	2.00E-03 J	MG/KG	W6-SB02	1/8	0.00015 - 0.00023	2.00E-03	NA	4.20E+02 SAT	1.00E+02	SSL	NO	BSL
	127-18-4	TETRACHLOROETHYLENE(PCE)	2.00E-03 J	2.00E-03 J	MG/KG	W6-SB02	1/8	0.00045 - 0.00056	2.00E-03	NA	3.82E+02 NC	3.00E-02	SSL	NO	BSL
	108-88-3	TOLUENE	9.00E-04 J	9.00E-04 J	MG/KG	W6-SB02	1/8	0.00023 - 0.00029	9.00E-04	NA	5.20E+02 SAT	6.00E+00	SSL	NO	BSL
	1330-20-7	XYLENES, TOTAL	6.00E-04 J	6.00E-04 J	MG/KG	W6-SB01	1/8	0.00015 - 0.00023	6.00E-04	NA	4.20E+02 SAT	1.00E+02	SSL	NO	BSL
	56-55-3	BENZO(a)ANTHRACENE	1.00E-01 J	1.00E-01 J	MG/KG	W6-SB01	1/8	0.02088 - 0.02856	1.00E-01	NA	2.11E+00 CA	8.00E-01	SSL	NO	BSL
	50-32-8	BENZO(a)PYRENE	5.90E-02 J	1.23E-01 J	MG/KG	W6-SB01	2/8	0.02685 - 0.03729	1.23E-01	NA	2.11E-01 CA	4.00E+00	SSL	NO	BSL
	205-99-2	BENZO(b)FLUORANTHENE	8.10E-02 J	8.70E-02 J	MG/KG	W6-SB06	2/8	0.02386 - 0.03253	8.70E-02	NA	2.11E+00 CA	2.00E+00	SSL	NO	BSL
	191-24-2	BENZO(g,h,i)PERYLENE	5.40E-02 J	6.90E-02 J	MG/KG	W6-SB01	2/8	0.02386 - 0.03332	6.90E-02	NA	2.91E+03 NC	2.10E+03	SSL	NO	BSL
	207-08-9	BENZO(k)FLUORANTHENE	5.20E-02 J	7.50E-02 J	MG/KG	W6-SB01	2/8	0.02834 - 0.03888	7.50E-02	NA	2.11E+01 CA	2.00E+01	SSL	NO	BSL
	117-81-7	bis(2-ETHYLHEXYL) PHTHALATE	1.35E-01 J	1.35E-01 J	MG/KG	W6-SB03	1/8	0.02983 - 0.04126	1.35E-01	NA	1.23E+02 CA	NA	NA	NO	BSL
	218-01-9	CHRYSENE	4.50E-02 J	1.22E-01 J	MG/KG	W6-SB01	2/8	0.02312 - 0.03174	1.22E-01	NA	2.11E+02 CA	8.00E+01	SSL	NO	BSL
	206-44-0	FLUORANTHENE	4.30E-02 J	1.25E-01 J	MG/KG	W6-SB01	2/8	0.02461 - 0.03412	1.25E-01	NA	2.20E+03 NC	2.10E+03	SSL	NO	BSL
	193-39-5	INDENO(1,2,3-c,d)PYRENE	6.20E-02 J	7.00E-02 J	MG/KG	W6-SB01	2/8	0.02088 - 0.02856	7.00E-02	NA	2.11E+00 CA	7.00E+00	SSL	NO	BSL
	85-01-8	PHENANTHRENE	8.50E-02 J	8.50E-02 J	MG/KG	W6-SB01	1/8	0.02312 - 0.03174	8.50E-02	NA	2.91E+03 NC	2.10E+03	SSL	NO	BSL
	129-00-0	PYRENE	3.10E-02 J	1.95E-01 J	MG/KG	W6-SB01	2/8	0.02237 - 0.03094	1.95E-01	NA	2.91E+03 NC	2.10E+03	SSL	NO	BSL
	72-54-8	p,p'-DDD	3.20E-04 J	1.30E-02 J	MG/KG	W6-SB01	5/8	0.00022 - 0.00023	1.30E-02	NA	9.95E+00 CA	8.00E+00	SSL	NO	BSL
	72-55-9	p,p'-DDE	8.80E-04 J	3.16E-01 J	MG/KG	W6-SB06	6/8	0.00033 - 0.00034	3.16E-01	NA	7.02E+00 CA	3.00E+01	SSL	NO	BSL
	50-29-3	p,p'-DDT	1.80E-03 J	1.90E-02 J	MG/KG	W6-SB06	2/8	0.00038 - 0.00039	1.90E-02	NA	7.02E+00 CA*	2.00E+01	SSL	NO	BSL
	7429-90-5	ALUMINUM	5.19E+03	1.25E+04	MG/KG	W6-SB06	8/8	2.55 - 2.62	1.25E+04	NA	1.00E+05 MAX	NA	NA	NO	BSL
	7440-36-0	ANTIMONY	4.60E-01 J	4.10E+00 J	MG/KG	W6-SB01	5/8	0.14 - 0.14	4.10E+00	NA	4.09E+01 NC	3.00E+00	SSL	NO	BSL
	7440-38-2	ARSENIC	8.80E-01 J	2.20E+00 J	MG/KG	W6-SB01	8/8	0.34 - 0.34	2.20E+00	NA	1.59E+00 CA	1.00E+00	SSL	YES	ASL
	7440-39-3	BARIUM	1.26E+01 J	3.69E+01 J	MG/KG	W6-SB06	8/8	0.01 - 0.01	3.69E+01	NA	6.66E+03 NC	8.20E+02	SSL	NO	BSL
	7440-41-7	BERYLLIUM	4.80E-02 J	1.40E-01 J	MG/KG	W6-SB04	6/8	0.03 - 0.03	1.40E-01	NA	1.94E+03 CA**	3.00E+01	SSL	NO	BSL
	7440-43-9	CADMIUM	1.40E-01 J	6.30E-01 J	MG/KG	W6-SB05	7/8	0.02 - 0.02	6.30E-01	NA	4.51E+01 NC	4.00E+00	SSL	NO	ASL
	7440-70-2	CALCIUM	4.26E+04 J	2.12E+05 J	MG/KG	W6-SB02	8/8	5.81 - 5.87	2.12E+05	NA	NA	NA	NA	NO	NUT
	7440-47-3	CHROMIUM, TOTAL	5.70E+00	2.54E+01	MG/KG	W6-SB06	8/8	0.05 - 0.05	2.54E+01	NA	6.40E+01 CA	2.00E+01	SSL	NO	ASL
	7440-48-4	COBALT	1.90E+00 J	9.40E+00 J	MG/KG	W6-SB04	8/8	0.05 - 0.05	9.40E+00	NA	1.92E+03 CA*	NA	NA	NO	BSL
	7440-50-8	COPPER	1.00E+01 J	1.37E+02 J	MG/KG	W6-SB06	8/8	0.19 - 0.19	1.37E+02	NA	4.09E+03 NC	NA	NA	NO	BSL
	7439-89-6	IRON	5.91E+03	2.51E+04	MG/KG	W6-SB04	8/8	1.19 - 1.26	2.51E+04	NA	1.00E+05 MAX	NA	NA	NO	BSL
	7439-92-1	LEAD	2.30E+00	3.32E+02	MG/KG	W6-SB01	8/8	0.11 - 0.11	3.32E+02	NA	7.50E+02 NC	NA	NA	NO	ASL
	7439-95-4	MAGNESIUM	2.92E+03	8.13E+03	MG/KG	W6-SB04	8/8	0.87 - 0.93	8.13E+03	NA	NA	NA	NA	NO	NUT
	7439-96-5	MANGANESE	7.20E+01	3.43E+02 J	MG/KG	W6-SB06	8/8	0.01 - 0.01	3.43E+02	NA	1.95E+03 NC	NA	NA	NO	BSL
	7439-97-6	MERCURY	1.80E-02 J	7.20E-02 J	MG/KG	W6-SB03	4/8	0.01 - 0.01	7.20E-02	NA	6.16E+00 NC	NA	NA	NO	ASL
	7440-02-0	NICKEL	1.40E+00 J	1.24E+01	MG/KG	W6-SB06	8/8	0.08 - 0.08	1.24E+01	NA	2.04E+03 NC	7.00E+01	SSL	NO	ASL

Table 2.2

OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN

SWMU 6 - Mangrove Disposal Site

NASD, Vieques Island, Puerto Rico

Scenario Timeframe: Current/Future
Medium: Subsurface Soil
Exposure Medium: Subsurface Soil

Exposure Point	CAS Number	Chemical	Minimum [1] Concentration Qualifier	Maximum [1] Concentration Qualifier	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration [2] Used for Screening	Background [3] Value	Screening [4] Toxicity Value	Potential ARAR/TBC Value	Potential ARAR/TBC Source	COPC Flag	Rationale for [5] Contaminant Deletion or Selection
	7440-09-7	POTASSIUM	1.59E+03 J	2.74E+03 J	MG/KG	W6-SB02	8/8	2.63 - 2.7	2.74E+03	NA	NA	NA	NA	NO	NUT
	7782-49-2	SELENIUM	2.90E-01 J	2.90E-01 J	MG/KG	W6-SB08	1/8	0.21 - 0.21	2.90E-01	NA	5.11E+02 NC	3.00E+00	SSL	NO	ASL
	7440-22-4	SILVER	1.10E-01 J	2.70E-01 J	MG/KG	W6-SB03	3/8	0.05 - 0.05	2.70E-01	NA	5.11E+02 NC	2.00E+01	SSL	NO	ASL
	7440-23-5	SODIUM	4.20E+03	1.65E+04	MG/KG	W6-SB01	8/8	11.47 - 11.53	1.65E+04	NA	NA	NA	NA	NO	NUT
	7440-28-0	THALLIUM	1.30E+00 J	1.50E+00 J	MG/KG	W6-SB01, W6-SB04	3/8	0.27 - 0.27	1.50E+00	NA	6.75E+00 NC	NA	NA	NO	BSL
	7440-62-2	VANADIUM	1.94E+01	8.02E+01	MG/KG	W6-SB04	8/8	0.08 - 0.08	8.02E+01	NA	7.15E+02 NC	3.00E+03	SSL	NO	BSL
	7440-66-6	ZINC	1.45E+01	2.16E+02	MG/KG	W6-SB01	8/8	0.25 - 0.25	2.16E+02	NA	1.00E+05 MAX	6.20E+03	SSL	NO	BSL

[1] Minimum/Maximum detected concentrations.

[2] Maximum concentration is used for screening.

[3] Background values not available.

[4] EPA Region 9 PRGs Table, October 1, 2002, U.S. EPA Region 9.
PRG value for xylenes used as surrogate for m,p-xylene and o-xylene.
PRG value for 2-methylnaphthalene calculated using provisional reference dose and methods described in Region 9 PRGs Table Users Guide/Technical Background Document, October 1, 2002, U.S. EPA Region 9.
PRG value for pyrene used as surrogate for benzo(g,h,i)perylene and phenanthrene.
PRG value for chromium VI used for total chromium.
PRG value for methyl mercury used as surrogate for mercury.
Lead screening toxicity value is 750 mg/kg, the EPA industrial soil screening level for lead.

[5] Rationale Codes

Selection Reason: Above Screening Levels (ASL)

Deletion Reason: No Toxicity Information (NTX)
Essential Nutrient (NUT)
Below Screening Level (BSL)

SSL = Soil Screening Level; Dilution Attenuation Factor = 10 (USEPA, October 2002)

COPC = Chemical of Potential Concern

ARAR/TBC = Applicable or Relevant and Appropriate Requirement/ To Be Considered

J = Estimated Value

CA = Carcinogenic

NC = Noncarcinogenic

CA* (where: NC < 100X CA)

CA**(where: NC < 10X CA)

SAT = Soil Saturation

MAX = Ceiling Limit

Table 2.3
OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN
SWMU 6 - Mangrove Disposal Site
NASD, Vieques Island, Puerto Rico

Scenario Timeframe: Current/Future
Medium: Groundwater
Exposure Medium: Groundwater

Exposure Point	CAS Number	Chemical	Minimum [1] Concentration Qualifier	Maximum [1] Concentration Qualifier	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration [2] Used for Screening	Background [3] Value	Screening [4] Toxicity Value		Potential ARAR/TBC Value	Potential ARAR/TBC Source	COPC Flag	Rationale for [5] Contaminant Deletion or Selection
SWMU 6 Groundwater	75-15-0	CARBON DISULFIDE	3.80E+00	3.80E+00	µg/L	NDW06MW07	1/10	0.3 - 0.3	3.80E+00	NA	1.04E+02	NC	NA	NA	NO	BSL
	67-66-3	CHLOROFORM	1.10E+00	1.10E+00	µg/L	NDW06MW01	1/10	0.15 - 1	1.10E+00	NA	6.17E-01	CA/NC	NA	NA	YES	ASL
	91-57-6	2-METHYLNAPHTHALENE	4.50E-01 J	4.50E-01 J	µg/L	NDW06MW01	1/10	0.2 - 0.3	4.50E-01	NA	1.22E+02	NC	NA	NA	NO	BSL
	105-60-2	CAPROLACTAM	1.30E+00 J	3.74E+01 J	µg/L	NDW06MW01	2/2	0.3 - 0.3	3.74E+01	NA	1.82E+03	NC	NA	NA	NO	BSL
	117-84-0	DI-n-OCTYLPHTHALATE	4.90E+00 J	4.90E+00 J	µg/L	NDW06MW04	1/10	1 - 3.2	4.90E+00	NA	1.46E+02	NC	NA	NA	NO	BSL
	91-20-3	NAPHTHALENE	3.90E-01 J	3.90E-01 J	µg/L	NDW06MW01	1/10	0.26 - 0.34	3.90E-01	NA	6.20E-01	NC	NA	NA	NO	BSL
	11104-28-2	PCB-1221 (AROCHLOR 1221)	7.00E-01	7.00E-01	µg/L	SWMU6-MW04	1/11	0.043 - 0.13	7.00E-01	NA	3.36E-02	CA	5.00E+00	MCL	YES	ASL
	11141-16-5	PCB-1232 (AROCHLOR 1232)	9.00E-02 J	9.00E-02 J	µg/L	SWMU6-MW04	1/11	0.03 - 0.09	9.00E-02	NA	3.36E-02	CA	5.00E+00	MCL	YES	ASL
	7601-90-3	Perchlorate	1.28E+01 J	1.28E+01 J	µg/L	NDW06MW01	1/10	3.22 - 40	1.28E+01	NA	3.65E-01	ca/nc	NA	NA	YES	ASL
	7429-90-5	ALUMINUM	1.64E+02 J	1.46E+03	µg/L	SWMU6-MW02	4/10	25.8 - 875	1.46E+03	NA	3.65E+03	NC	5.00E+01	NSDWS	NO	NUT
	7440-36-0	ANTIMONY	3.70E+00 J	1.04E+02 J	µg/L	NDW06MW03	4/10	1.4 - 62.5	1.04E+02	NA	1.46E+00	NC	6.00E+00	MCL	YES	ASL
	7440-38-2	ARSENIC	3.50E+00 J	1.52E+02 J	µg/L	NDW06MW05	7/10	3.4 - 51	1.52E+02	NA	4.48E-02	CA	1.00E+01	MCL	YES	ASL
	7440-39-3	BARIUM	1.22E+02 J	7.28E+02 J	µg/L	NDW06MW02	10/10	0.1 - 12.3	7.28E+02	NA	2.55E+02	NC	2.00E+03	MCL	YES	ASL
	7440-41-7	BERYLLIUM	3.20E-01 J	3.92E+00 J	µg/L	NDW06MW07	5/10	0.3 - 2.36	3.92E+00	NA	7.30E+00	NC	4.00E+00	MCL	NO	BSL
	7440-22-4	CADMIUM	2.00E+00 J	1.42E+01 J	µg/L	NDW06MW05	5/10	0.2 - 8.9	1.42E+01	NA	1.82E+00	NC	5.00E+00	MCL	YES	ASL
	7440-70-2	CALCIUM	3.55E+05	1.12E+06	µg/L	NDW06MW07	10/10	58.5 - 812	1.12E+06	NA	NA		NA	NA	NO	NUT
	7440-47-3	CHROMIUM, TOTAL	2.70E+00 J	5.88E+01 J	µg/L	NDW06MW05	7/10	0.5 - 14.2	5.88E+01	NA	1.09E+01	NC	1.00E+02	MCL	YES	ASL
	7440-48-4	COBALT	1.70E+00 J	5.99E+01 J	µg/L	NDW06MW05	5/10	0.5 - 14.2	5.99E+01	NA	7.30E+01	NC	NA	NA	NO	BSL
	7440-50-8	COPPER	1.00E+01 J	3.36E+01 J	µg/L	NDW06MW05	3/10	1.9 - 29.2	3.36E+01	NA	1.09E+03	NC	1.30E+03	AL	NO	BSL
	7439-89-6	IRON	4.30E+01 J	6.09E+03 J	µg/L	NDW06MW03	7/10	12.2 - 418	6.09E+03	NA	1.09E+03	NC	3.00E+02	NSDWS	YES	ASL
	7439-92-1	LEAD	1.80E+00 J	9.70E+01	µg/L	NDW06MW02	8/10	1.1 - 44	9.70E+01	NA	NA		1.50E-02	AL	NO	NTX
	7439-95-4	MAGNESIUM	1.91E+06	2.99E+06	µg/L	NDW06MW01	10/10	45 - 131	2.99E+06	NA	NA		NA	NA	NO	NUT
	7439-96-5	MANGANESE	3.39E+02	1.43E+04	µg/L	SWMU6-MW01	10/10	0.1 - 4.18	1.43E+04	NA	8.76E+01	NC	5.00E+01	NSDWS	YES	ASL
	7439-97-6	MERCURY	2.40E-02 J	2.40E-02 J	µg/L	NDW06MW07	1/10	0.0162 - 0.18	2.40E-02	NA	3.65E-01	NC	2.00E+00	MCL	NO	BSL
	7440-02-0	NICKEL	1.50E+00 J	2.66E+01 J	µg/L	NDW06MW05	5/10	0.8 - 24.9	2.66E+01	NA	7.30E+01	NC	NA	NA	NO	BSL
	7440-09-7	POTASSIUM	7.00E+05 J	1.05E+06	µg/L	NDW06MW01	6/10	26.6 - 288	1.05E+06	NA	NA		NA	NA	NO	NUT
	7782-49-2	SELENIUM	2.90E+00 J	1.33E+02	µg/L	NDW06MW02	9/10	2.1 - 52.5	1.33E+02	NA	1.82E+01	NC	5.00E+01	MCL	YES	ASL
	7440-22-4	SILVER	6.71E+00 J	5.64E+01 J	µg/L	NDW06MW05	3/10	0.5 - 11.8	5.64E+01	NA	1.82E+01	NC	1.00E+02	NSDWS	YES	ASL
	7440-23-5	SODIUM	1.35E+07 J	1.92E+07 J	µg/L	NDW06MW01	10/10	454 - 11500	1.92E+07	NA	NA		NA	NA	NO	NUT
	7440-28-0	THALLIUM	5.65E+01 J	6.04E+01 J	µg/L	NDW06MW05	2/10	2.7 - 63.5	6.04E+01	NA	2.41E-01	NC	2.00E+00	MCL	YES	ASL
	7440-62-2	VANADIUM	3.70E+00 J	1.54E+01 J	µg/L	NDW06MW05	5/10	0.8 - 11.2	1.54E+01	NA	2.55E+01	NC	NA	NA	NO	BSL
	7440-66-6	ZINC	1.77E+02	1.77E+02	µg/L	SWMU6-MW04	1/10	4.09 - 12.5	1.77E+02	NA	1.09E+03	NC	5.00E+03	NSDWS	NO	BSL
	7440-36-0	ANTIMONY, DISSOLVED	1.80E+00 J	1.80E+00 J	µg/L	SWMU6-MW03	1/10	1.4 - 62.5	1.80E+00	NA	1.46E+00	NC	6.00E+00	MCL	YES	ASL
	7440-38-2	ARSENIC, DISSOLVED	4.80E+00 J	2.52E+01 J	µg/L	NDW06MW02	7/10	3.4 - 51	2.52E+01	NA	4.48E-02	CA	1.00E+01	MCL	YES	ASL
	7440-39-3	BARIUM, DISSOLVED	1.35E+02 J	7.80E+02 J	µg/L	NDW06MW02	10/10	0.1 - 12.3	7.80E+02	NA	2.55E+02	NC	2.00E+03	MCL	YES	ASL
	7440-41-7	BERYLLIUM, DISSOLVED	3.50E+00 J	5.53E+00 J	µg/L	NDW06MW04	2/10	0.3 - 2.36	5.53E+00	NA	7.30E+00	NC	4.00E+00	MCL	NO	BSL
	7440-43-9	CADMIUM, DISSOLVED	1.80E+00 J	2.90E+00 J	µg/L	SWMU6-MW01	4/10	0.2 - 8.9	2.90E+00	NA	1.82E+00	NC	5.00E+00	MCL	YES	ASL
	7440-70-2	CALCIUM, DISSOLVED	3.32E+05	1.15E+06	µg/L	NDW06MW07	10/10	58.5 - 812	1.15E+06	NA	NA		NA	NA	NO	NUT
	7440-47-3	CHROMIUM, DISSOLVED	4.50E+00 J	1.98E+01 J	µg/L	NDW06MW04	6/10	0.5 - 14.2	1.98E+01	NA	1.09E+01	NC	1.00E+02	MCL	YES	ASL
	7440-48-4	COBALT, DISSOLVED	5.50E-01 J	2.55E+01 J	µg/L	NDW06MW04	7/10	0.5 - 14.2	2.55E+01	NA	7.30E+01	NC	2.00E+00	MCL	NO	BSL
	7439-89-6	IRON, DISSOLVED	1.27E+01 J	5.23E+03 J	µg/L	NDW06MW03	4/7	12.2 - 418	5.23E+03	NA	1.09E+03	NC	3.00E+02	NSDWS	YES	ASL
	7439-92-1	LEAD, DISSOLVED	2.60E+00 J	2.60E+02 J	µg/L	NDW06MW05	7/10	1.1 - 176	2.60E+02	NA	NA		1.50E-02	AL	NO	ASL

Table 2.3

OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN

SWMU 6 - Mangrove Disposal Site

NASD, Vieques Island, Puerto Rico

Scenario Timeframe: Current/Future
Medium: Groundwater
Exposure Medium: Groundwater

Exposure Point	CAS Number	Chemical	Minimum [1] Concentration Qualifier	Maximum [1] Concentration Qualifier	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration [2] Used for Screening	Background [3] Value	Screening [4] Toxicity Value	Potential ARAR/TBC Value	Potential ARAR/TBC Source	COPC Flag	Rationale for [5] Contaminant Deletion or Selection
	7439-95-4	MAGNESIUM, DISSOLVED	1.90E+06	2.77E+06	µg/L	NDW06MW01	10/10	45 - 131	2.77E+06	NA	NA	NA	NA	NO	NUT
	7439-96-5	MANGANESE, DISSOLVED	3.15E+02 J	1.18E+04	µg/L	SWMU6-MW01	10/10	0.1 - 4.18	1.18E+04	NA	8.76E+01 NC	5.00E+01	NSDWS	YES	ASL
	7439-97-6	MERCURY, DISSOLVED	2.41E-02 J	5.40E-02 J	µg/L	NDW06MW01	5/10	0.0162 - 0.18	5.40E-02	NA	3.65E-01 NC	2.00E+00	MCL	NO	BSL
	7440-02-0	NICKEL, DISSOLVED	1.00E+00 J	4.00E+00 J	µg/L	SWMU6-MW04	4/10	0.8 - 24.9	4.00E+00	NA	7.30E+01 NC	NA	NA	NO	BSL
	7440-09-7	POTASSIUM, DISSOLVED	6.86E+05 J	1.08E+06 J	µg/L	NDW06MW01, NDW06MW02	6/10	26.6 - 288	1.08E+06	NA	NA	NA	NA	NO	NUT
	7782-49-2	SELENIUM, DISSOLVED	5.00E+00 J	2.58E+02 J	µg/L	NDW06MW03	7/10	2.1 - 210	2.58E+02	NA	1.82E+01 NC	5.00E+01	MCL	YES	ASL
	7440-22-4	SILVER, DISSOLVED	9.30E-01 J	2.10E+00 J	µg/L	SWMU6-MW04	2/10	0.5 - 11.8	2.10E+00	NA	1.82E+01 NC	1.00E+02	NSDWS	NO	BSL
	7440-23-5	SODIUM, DISSOLVED	1.34E+07	1.89E+07	µg/L	NDW06MW01	10/10	568 - 11500	1.89E+07	NA	NA	NA	NA	NO	NUT
	7440-62-2	VANADIUM, DISSOLVED	2.70E+00 J	8.10E+00 J	µg/L	SWMU6-MW04	4/10	0.8 - 11.2	8.10E+00	NA	2.55E+01 NC	NA	NA	NO	BSL

[1] Minimum/Maximum detected concentrations.

[2] Maximum concentration is used for screening.

[3] Background values not available.

[4] EPA Region 9 PRGs Table, October 1, 2002, U.S. EPA Region 9.
PRG value for 2-methylnaphthalene calculated using provisional reference dose and methods described in Region 9 PRGs Table Users Guide/Technical Background Document, October 1, 2002, U.S. EPA Region 9.
PRG value for chromium VI used for total chromium.
PRG value for methyl mercury used as surrogate for mercury.
Lead action level is 15 µg/L.

[5] Rationale Codes

Selection Reason: Above Screening Levels (ASL)

Deletion Reason: No Toxicity Information (NTX)
Essential Nutrient (NUT)
Below Screening Level (BSL)

MCL = Maximum Contaminant Level from EPA's National Primary Drinking Water Standards
The highest level of a contaminant that is allowed in drinking water. MCLs are set as close to MCLGs as feasible using the best available treatment technology and taking cost into consideration. MCLs are enforceable standards.

NSDWS = National Secondary Drinking Water Standards are non-enforceable guidelines regulating contaminants that may cause cosmetic effects (such as skin or tooth discoloration) or aesthetic effects (such as taste, odor, or color) in drinking water.

AL = Action Level

COPC = Chemical of Potential Concern

ARAR/TBC = Applicable or Relevant and Appropriate Requirement/ To Be Considered

J = Estimated Value

CA = Carcinogenic

NC = Noncarcinogenic

Table 2.4
OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN
SWMU 6 - Mangrove Disposal Site
NASD, Vieques Island, Puerto Rico

Scenario Timeframe: Current/Future
Medium: Sediment
Exposure Medium: Sediment

Exposure Point	CAS Number	Chemical	Minimum [1] Concentration Qualifier	Maximum [1] Concentration Qualifier	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration [2] Used for Screening	Background [3] Value	Screening [4] Toxicity Value	Potential ARAR/TBC Value	Potential ARAR/TBC Source	COPC Flag	Rationale for [5] Contaminant Deletion or Selection
SWMU 6 Sediment	67-64-1	ACETONE	2.68E-01 J	6.04E-01 J	MG/KG	NDW06SD14	3/12	0.004 - 0.0221	6.04E-01	NA	1.57E+02 NC	8.00E+00	SSL	NO	BSL
	75-15-0	CARBON DISULFIDE	8.00E-04 J	2.20E-02 J	MG/KG	W6-SD03	12/19	0.00023 - 0.003	2.20E-02	NA	3.55E+01 NC	2.00E+01	SSL	NO	BSL
	100-41-4	ETHYLBENZENE	1.00E-03 J	2.00E-03 J	MG/KG	W6-SD05	3/19	0.0002 - 0.0023	2.00E-03	NA	8.92E+00 CA	7.00E+00	SSL	NO	BSL
	108-38-3/106-42	M,P-XYLENE (SUM OF ISOMERS)	3.00E-04 J	1.30E-02 J	MG/KG	W6-SD03	5/7	0.00014 - 0.00024	1.30E-02	NA	2.75E+01 NC	1.00E+02	SSL	NO	BSL
	78-93-3	METHYL ETHYL KETONE (2-BUTANONE)	4.00E-03 J	1.70E-02 J	MG/KG	W6-SD03	5/17	0.0012 - 0.0066	1.70E-02	NA	7.33E+02 NC	NA	SSL	NO	BSL
	75-09-2	METHYLENE CHLORIDE	7.70E-04 J	8.20E-03 J	MG/KG	NDW06SD07	12/19	0.00053 - 0.0029	8.20E-03	NA	9.11E+00 CA	1.00E-02	SSL	NO	BSL
	95-47-6	O-XYLENE (1,2-DIMETHYLBENZENE)	2.00E-03 J	3.00E-03 J	MG/KG	W6-SD03, W6-SD05	4/7	0.00014 - 0.00024	3.00E-03	NA	2.75E+01 NC	1.00E+02	SSL	NO	BSL
	108-88-3	TOLUENE	3.00E-03 J	3.00E-03 J	MG/KG	W6-SD03, W6-SD04, W6-SD05, W6-SD07	4/19	0.0002 - 0.0022	3.00E-03	NA	5.20E+02 SAT	6.00E+00	SSL	NO	BSL
	1330-20-7	XYLENES, TOTAL	3.00E-04 J	1.60E-02 J	MG/KG	W6-SD03	5/19	0.00014 - 0.0058	1.60E-02	NA	2.75E+01 NC	1.00E+02	SSL	NO	BSL
	120-12-7	ANTHRACENE	3.80E-02 J	3.80E-02 J	MG/KG	NDW06SD12	1/19	0.01992 - 0.0674	3.80E-02	NA	2.19E+03 NC	5.90E+03	SSL	NO	BSL
	56-55-3	BENZO(a)ANTHRACENE	6.46E-02 J	6.46E-02 J	MG/KG	NDW06SD12	1/19	0.01865 - 0.0835	6.46E-02	NA	6.21E-01 CA	8.00E-01	SSL	NO	BSL
	50-32-8	BENZO(a)PYRENE	7.97E-02 J	7.97E-02 J	MG/KG	NDW06SD12	1/19	0.02394 - 0.0674	7.97E-02	NA	6.21E-02 CA	4.00E+00	SSL	YES	ASL
	205-99-2	BENZO(b)FLUORANTHENE	9.16E-02 J	9.16E-02 J	MG/KG	NDW06SD12	1/19	0.0198 - 0.0514	9.16E-02	NA	6.21E-01 CA	2.00E+00	SSL	NO	BSL
	191-24-2	BENZO(g,h,i)PERYLENE	4.09E-02 J	4.09E-02 J	MG/KG	NDW06SD10	1/19	0.0214 - 0.061	4.09E-02	NA	2.32E+02 NC	2.10E+03	SSL	NO	BSL
	207-08-9	BENZO(k)FLUORANTHENE	7.84E-02 J	7.84E-02 J	MG/KG	NDW06SD12	1/19	0.021 - 0.0546	7.84E-02	NA	6.21E+00 CA	2.00E+01	SSL	NO	BSL
	117-81-7	bis(2-ETHYLHEXYL) PHTHALATE	1.19E-01 J	4.46E-01 J	MG/KG	NDW06SD05	6/19	0.0267 - 0.0995	4.46E-01	NA	3.47E+01 CA*	NA	SSL	NO	BSL
	218-01-9	CHRYSENE	6.80E-02 J	6.80E-02 J	MG/KG	NDW06SD12	1/19	0.02034 - 0.0642	6.80E-02	NA	6.21E+01 CA	8.00E+01	SSL	NO	BSL
	206-44-0	FLUORANTHENE	3.63E-02 J	3.63E-02 J	MG/KG	NDW06SD12	1/19	0.02204 - 0.0578	3.63E-02	NA	2.29E+02 NC	2.10E+03	SSL	NO	BSL
	129-00-0	PYRENE	3.07E-02 J	5.04E-02 J	MG/KG	NDW06SD12	2/19	0.01992 - 0.0706	5.04E-02	NA	2.32E+02 NC	2.10E+03	SSL	NO	BSL
	72-54-8	p,p'-DDD	2.60E-04 J	6.70E-01 J	MG/KG	NDW06SD13	6/18	0.00016 - 0.034	6.70E-01	NA	2.44E+00 CA	8.00E+00	SSL	NO	BSL
	72-55-9	p,p'-DDE	8.10E-04 J	4.10E-01 J	MG/KG	NDW06SD13	5/17	0.000067 - 0.014	4.10E-01	NA	1.72E+00 CA	3.00E+01	SSL	NO	BSL
	50-29-3	p,p'-DDT	3.50E-04 J	8.60E-03 J	MG/KG	NDW06SD05	3/18	0.00024 - 0.006	8.60E-03	NA	1.72E+00 CA*	2.00E+01	SSL	NO	BSL
	7429-90-5	ALUMINUM	1.81E+03	1.93E+04	MG/KG	W6-SD03	19/19	1.76 - 4.54	1.93E+04	NA	7.61E+03 NC	NA	SSL	YES	ASL
	7440-36-0	ANTIMONY	3.07E-01 J	9.78E+01 J	MG/KG	W6-SD02	15/19	0.113 - 0.292	9.78E+01	NA	3.13E+00 NC	3.00E+00	SSL	YES	ASL
	7440-38-2	ARSENIC	1.10E+00 J	5.55E+02	MG/KG	W6-SD02	19/19	0.165 - 0.426	5.55E+02	NA	3.90E-01 CA*	1.00E+01	SSL	YES	ASL
	7440-39-3	BARIUM	4.48E+00 J	5.71E+02	MG/KG	W6-SD02	19/19	0.01 - 0.0281	5.71E+02	NA	5.37E+02 NC	8.20E+02	SSL	YES	ASL
	7440-41-7	BERYLLIUM	4.17E-02 J	1.42E+01	MG/KG	W6-SD02	19/19	0.0172 - 0.0444	1.42E+01	NA	1.54E+01 NC	3.00E+01	SSL	NO	BSL
	7440-43-9	CADMIUM	2.52E-02 J	1.37E+01	MG/KG	W6-SD02	12/19	0.015 - 0.0389	1.37E+01	NA	3.70E+00 NC	4.00E+00	SSL	YES	ASL
	7440-70-2	CALCIUM	1.63E+03	1.35E+05	MG/KG	NDW06SD14	19/19	1.15 - 19	1.35E+05	NA	NA	NA	SSL	NO	NUT
	7440-47-3	CHROMIUM, TOTAL	1.99E+00 J	6.78E+01	MG/KG	W6-SD02	19/19	0.0483 - 0.125	6.78E+01	NA	3.01E+01 CA**	2.00E+01	SSL	YES	ASL
	7440-48-4	COBALT	9.17E-01 J	1.42E+02	MG/KG	W6-SD02	19/19	0.039 - 0.101	1.42E+02	NA	9.03E+02 CA**	NA	SSL	NO	BSL
	7440-50-8	COPPER	2.87E+00 J	1.01E+02	MG/KG	W6-SD02	19/19	0.0765 - 0.198	1.01E+02	NA	3.13E+02 NC	NA	SSL	NO	BSL
	7439-89-6	IRON	2.64E+03	2.57E+04	MG/KG	W6-SD03	19/19	1.2 - 3.52	2.57E+04	NA	2.35E+03 NC	NA	SSL	YES	ASL
	7439-92-1	LEAD	4.68E-01 J	1.44E+02	MG/KG	W6-SD02	19/19	0.11 - 0.58	1.44E+02	NA	4.00E+02 NC	NA	SSL	NO	ASL
	7439-95-4	MAGNESIUM	2.31E+03	1.16E+04	MG/KG	W6-SD03	19/19	0.88 - 3.47	1.16E+04	NA	NA	NA	SSL	NO	NUT
	7439-96-5	MANGANESE	3.02E+01	3.88E+02 J	MG/KG	NDW06SD08	19/19	0.01 - 0.0628	3.88E+02	NA	1.76E+02 NC	NA	SSL	YES	ASL
	7439-97-6	MERCURY	2.65E-03 J	2.10E-01 J	MG/KG	W6-SD02	14/19	0.000666 - 0.01	2.10E-01	NA	6.11E-01 NC	NA	SSL	NO	BSL
	7440-02-0	NICKEL	6.66E-01 J	1.43E+02	MG/KG	W6-SD02	19/19	0.0664 - 0.172	1.43E+02	NA	1.56E+02 NC	7.00E+01	SSL	NO	BSL
	7440-09-7	POTASSIUM	8.22E+02 J	6.55E+03	MG/KG	W6-SD03	19/19	2.64 - 8.51	6.55E+03	NA	NA	NA	SSL	NO	NUT
	7782-49-2	SELENIUM	2.52E-01 J	5.44E+02	MG/KG	W6-SD02	14/19	0.21 - 0.609	5.44E+02	NA	3.91E+01 NC	3.00E+00	SSL	YES	ASL
	7440-22-4	SILVER	3.86E-02 J	1.45E+01	MG/KG	W6-SD02	4/19	0.0286 - 0.0738	1.45E+01	NA	3.91E+01 NC	2.00E+01	SSL	NO	BSL
	7440-23-5	SODIUM	5.71E+03	4.57E+04	MG/KG	W6-SD03	19/19	1.87 - 11.52	4.57E+04	NA	NA	NA	SSL	NO	NUT
	7440-28-0	THALLIUM	5.86E-01 J	5.72E+02	MG/KG	W6-SD02	5/19	0.144 - 0.373	5.72E+02	NA	5.16E-01 NC	NA	SSL	YES	ASL
	7440-62-2	VANADIUM	6.51E+00 J	1.74E+02	MG/KG	W6-SD02	19/19	0.0431 - 0.111	1.74E+02	NA	5.47E+01 NC	3.00E+03	SSL	YES	ASL

Table 2.4
OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN
SWMU 6 - Mangrove Disposal Site
NASD, Vieques Island, Puerto Rico

Scenario Timeframe: Current/Future
Medium: Sediment
Exposure Medium: Sediment

Exposure Point	CAS Number	Chemical	Minimum [1] Concentration Qualifier	Maximum [1] Concentration Qualifier	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration [2] Used for Screening	Background [3] Value	Screening [4] Toxicity Value	Potential ARAR/TBC Value	Potential ARAR/TBC Source	COPC Flag	Rationale for [5] Contaminant Deletion or Selection
	7440-66-6	ZINC	1.29E+01	2.41E+02	MG/KG	NDW06SD10	14/14	0.0769 - 0.25	2.41E+02	NA	2.35E+03 NC	6.20E+03	SSL	NO	BSL

[1] Minimum/Maximum detected concentrations.
[2] Maximum concentration is used for screening.
[3] Background values not available.
[4] EPA Region 9 PRGs Table, October 1, 2002, U.S. EPA Region 9.
PRG value for xylenes used as surrogate for m,p-xylene and o-xylene.
PRG value for 2-methylnaphthalene calculated using provisional reference dose and methods described in Region 9 PRGs Table Users Guide/Technical Background Document, October 1, 2002, U.S. EPA Region 9.
PRG value for pyrene used as surrogate for benzo(g,h,i)perylene and phenanthrene.
RBC value for naphthalene used as surrogate for acenaphthylene.
PRG value for chromium VI used for total chromium.
PRG value for methyl mercury used as surrogate for mercury.
Lead screening toxicity value is 400 mg/kg, the EPA residential soil screening level for lead.
[5] Rationale Codes

Selection Reason: Above Screening Levels (ASL)
Deletion Reason: No Toxicity Information (NTX)
Essential Nutrient (NUT)
Below Screening Level (BSL)

SSL = Soil Screening Level; Dilution Attenuation Factor = 10 (USEPA, October 2002)
COPC = Chemical of Potential Concern
ARAR/TBC = Applicable or Relevant and Appropriate Requirement/ To Be Considered
CA = Carcinogenic
NC = Noncarcinogenic
CA* (where: NC < 100X CA)
CA**(where: NC < 10X CA)
SAT = Soil Saturation

Table 2.5

OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN

SWMU 6 - Mangrove Disposal Site

NASD, Vieques Island, Puerto Rico

Scenario Timeframe: Current/Future
Medium: Surface Water
Exposure Medium: Surface Water

Exposure Point	CAS Number	Chemical	Minimum [1] Concentration Qualifier	Maximum [1] Concentration Qualifier	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration [2] Used for Screening	Background [3] Value	Screening [4] Toxicity Value	Potential ARAR/TBC Value	Potential ARAR/TBC Source	COPC Flag	Rationale for [5] Contaminant Deletion or Selection
SWMU 6 Surface Water	117-84-0	DI-n-OCTYLPHTHALATE	6.00E+00	6.00E+00	µg/L	NDW06SW09	1/14	1 - 6.2	6.00E+00	NA	1.46E+02 NC	NA	NA	NO	BSL
	84-66-2	DIETHYL PHTHALATE	5.00E-01 J	6.00E-01 J	µg/L	W6-SW01	3/14	0.38 - 0.78	6.00E-01	NA	2.92E+03 NC	NA	NA	NO	BSL
	7429-90-5	ALUMINUM	7.09E+02 J	2.97E+03	µg/L	W6-SW07	12/14	25.8 - 700	2.97E+03	NA	3.65E+03 NC	NA	NA	NO	BSL
	7440-38-2	ARSENIC	3.80E+00 J	5.30E+00 J	µg/L	W6-SW06	3/14	3.4 - 40.8	5.30E+00	NA	4.48E-02 CA	NA	NA	YES	ASL
	7440-39-3	BARIUM	1.03E+01 J	1.51E+01 J	µg/L	W6-SW07	13/14	0.1 - 9.82	1.51E+01	NA	2.55E+02 NC	NA	NA	NO	BSL
	7440-22-4	CADMIUM	1.90E+00 J	2.00E+00 J	µg/L	W6-SW03, W6-SW04, W6-SW05	7/14	0.2 - 7.12	2.00E+00	NA	1.82E+01 NC	NA	NA	NO	BSL
	7440-70-2	CALCIUM	4.34E+05 J	4.87E+05 J	µg/L	W6-SW07	14/14	58.5 - 650	4.87E+05	NA	NA	NA	NA	NO	NUT
	7440-47-3	CHROMIUM, TOTAL	5.10E-01 J	1.10E+00 J	µg/L	W6-SW01, W6-SW03	5/14	0.5 - 11.4	1.10E+00	NA	1.09E+01 NC	NA	NA	NO	BSL
	7440-48-4	COBALT	7.10E-01 J	1.10E+00 J	µg/L	W6-SW03	2/14	0.5 - 11.4	1.10E+00	NA	7.30E+01 NC	NA	NA	NO	BSL
	7440-50-8	COPPER	1.90E+00 J	3.89E+01 J	µg/L	NDW06SW07	7/14	1.9 - 23.4	3.89E+01	NA	1.46E+02 NC	NA	NA	NO	BSL
	7439-89-6	IRON	6.14E+02 J	1.41E+03 J	µg/L	W6-SW07	7/14	12.2 - 334	1.41E+03	NA	1.09E+03 NC	NA	NA	YES	ASL
	7439-92-1	LEAD	1.20E+00 J	1.47E+01	µg/L	W6-SW06	4/14	1.1 - 35.2	1.47E+01	NA	NA NC	NA	NA	NO	NTX
	7439-95-4	MAGNESIUM	1.31E+06 J	1.54E+06	µg/L	W6-SW07	14/14	45 - 105	1.54E+06	NA	NA	NA	NA	NO	BSL
	7439-96-5	MANGANESE	5.30E+00 J	4.20E+01 J	µg/L	NDW06SW07	13/14	0.1 - 3.34	4.20E+01	NA	8.76E+01 NC	NA	NA	NO	BSL
	7439-97-6	MERCURY	1.72E-02 J	1.60E+00 J	µg/L	W6-SW03	7/8	0.0162 - 0.18	1.60E+00	NA	3.65E-01 NC	NA	NA	YES	ASL
	7440-02-0	NICKEL	9.60E-01 J	1.10E+00 J	µg/L	W6-SW02, W6-SW03	2/14	0.8 - 19.9	1.10E+00	NA	7.30E+01 NC	NA	NA	NO	BSL
	7440-09-7	POTASSIUM	4.12E+05	7.09E+05 J	µg/L	NDW06SW02, NDW06SW08	8/14	26.6 - 230	7.09E+05	NA	NA	NA	NA	NO	NUT
	7782-49-2	SELENIUM	2.70E+00 J	6.40E+00	µg/L	W6-SW03	7/14	2.1 - 42	6.40E+00	NA	1.82E+01 NC	NA	NA	NO	BSL
	7440-22-4	SILVER	7.10E+00 J	7.10E+00 J	µg/L	W6-SW05	1/14	2.5 - 9.44	7.10E+00	NA	1.82E+01 NC	NA	NA	NO	BSL
	7440-23-5	SODIUM	1.04E+07 J	1.21E+07 J	µg/L	W6-SW07	14/14	454 - 11500	1.21E+07	NA	NA	NA	NA	NO	NUT
	7440-28-0	THALLIUM	4.90E+00 J	4.90E+00 J	µg/L	W6-SW02	1/14	2.7 - 50.8	4.90E+00	NA	2.41E-01 NC	NA	NA	YES	ASL
	7440-62-2	VANADIUM	2.50E+00 J	5.80E+00 J	µg/L	W6-SW07	7/14	0.8 - 8.94	5.80E+00	NA	2.55E+01 NC	NA	NA	NO	BSL
	7440-70-2	CALCIUM, DISSOLVED	3.97E+05 J	4.19E+05 J	µg/L	NDW06SW02	7/7	650 - 650	4.19E+05	NA	NA	NA	NA	NO	NUT
	7439-95-4	MAGNESIUM, DISSOLVED	1.22E+06 J	1.27E+06 J	µg/L	NDW06SW02	7/7	105 - 105	1.27E+06	NA	NA	NA	NA	NO	NUT
	7439-96-5	MANGANESE, DISSOLVED	6.13E+00 J	2.45E+01 J	µg/L	NDW06SW08	4/7	3.34 - 3.34	2.45E+01	NA	8.76E+01 NC	NA	NA	NO	BSL
	7439-97-6	MERCURY, DISSOLVED	2.41E-02 J	4.52E-02 J	µg/L	NDW06SW05	6/7	0.0162 - 0.0162	4.52E-02	NA	3.65E-01 NC	NA	NA	NO	BSL
	7440-02-0	NICKEL, DISSOLVED	5.20E+01 J	5.20E+01 J	µg/L	NDW06SW02	1/7	19.9 - 19.9	5.20E+01	NA	7.30E+01 NC	NA	NA	NO	BSL
	7440-09-7	POTASSIUM, DISSOLVED	6.47E+05 J	6.67E+05 J	µg/L	NDW06SW02	7/7	230 - 230	6.67E+05	NA	NA	NA	NA	NO	NUT
	7440-23-5	SODIUM, DISSOLVED	1.01E+07 J	1.04E+07 J	µg/L	NDW06SW02	7/7	454 - 454	1.04E+07	NA	NA	NA	NA	NO	NUT

[1] Minimum/Maximum detected concentrations.

[2] Maximum concentration is used for screening.

[3] Background values not available.

[4] EPA Region 9 PRGs Table, October 1, 2002, U.S. EPA Region 9.
PRG value for chromium VI used for total chromium.
PRG value for methyl mercury used as surrogate for mercury.
Lead action level is 15 µg/L.

[5] Rationale Codes

Selection Reason: Above Screening Levels (ASL)
Deletion Reason: No Toxicity Information (NTX)

COPC = Chemical of Potential Concern
ARAR/TBC = Applicable or Relevant and Appropriate Requirement/ To Be Considered
J = Estimated Value
CA = Carcinogenic
NC = Noncarcinogenic

Table 2.5

OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN

SWMU 6 - Mangrove Disposal Site

NASD, Vieques Island, Puerto Rico

Scenario Timeframe: Current/Future

Medium: Surface Water

Exposure Medium: Surface Water

Essential Nutrient (NUT)

Below Screening Level (BSL)

Table 3.1.RME
REASONABLE MAXIMUM EXPOSURE
SWMU 6 - Mangrove Disposal Site
NASD, Vieques Island, Puerto Rico

Scenario Timeframe: Current/Future
Medium: Surface Soil
Exposure Medium: Surface Soil

Exposure Point	Chemical of Potential Concern	Units	Arithmetic Mean	UCL (Distribution)	Maximum Concentration (Qualifier)	Exposure Point Concentration			
						Value	Units	Statistic	Rationale
SWMU 6 Surface Soil									
	BENZO(a)ANTHRACENE	MG/KG	3.11E-01	6.26E-01 (NP)	1.87E+00	6.26E-01	MG/KG	95% Cheb-m	(3)
	BENZO(a)PYRENE	MG/KG	3.08E-01	5.89E-01 (NP)	1.51E+00	5.89E-01	MG/KG	95% Cheb-m	(3)
	BENZO(b)FLUORANTHENE	MG/KG	3.02E-01	6.16E-01 (NP)	1.80E+00	6.16E-01	MG/KG	95% Cheb-m	(3)
	DIBENZ(a,h)ANTHRACENE	MG/KG	2.58E-01	3.14E-01 (NP)	3.45E-01 J	3.14E-01	MG/KG	95% Cheb-m	(3)
	INDENO(1,2,3-c,d)PYRENE	MG/KG	2.86E-01	4.81E-01 (NP)	1.13E+00	4.81E-01	MG/KG	95% Cheb-m	(3)
	ALUMINUM	MG/KG	7.10E+03	8.52E+03 (T)	1.40E+04	8.52E+03	MG/KG	95% UCL-T	(1)
	ANTIMONY	MG/KG	1.22E+00	2.26E+00 (T)	1.33E+01 J	2.26E+00	MG/KG	95% UCL-T	(1)
	ARSENIC	MG/KG	1.71E+00	3.51E+00 (NP)	7.90E+00 J	3.51E+00	MG/KG	95% Cheb-m	(3)
	CHROMIUM, TOTAL	MG/KG	1.31E+01	1.86E+01 (T)	4.29E+01	1.86E+01	MG/KG	95% UCL-T	(1)
	IRON	MG/KG	1.85E+04	2.80E+04 (T)	9.32E+04	2.80E+04	MG/KG	95% UCL-T	(1)
	LEAD	MG/KG	7.85E+01	2.82E+02 (NP)	6.17E+02	2.82E+02	MG/KG	97.5% Cheb-m	(3)
	MANGANESE	MG/KG	1.98E+02	3.44E+02 (T)	7.41E+02	3.44E+02	MG/KG	95% UCL-T	(1)
	THALLIUM	MG/KG	3.50E-01	1.15E+00 (NP)	4.30E+00	1.15E+00	MG/KG	95% Cheb-m	(3)
	VANADIUM	MG/KG	2.82E+01	4.53E+01 (NP)	7.14E+01	4.53E+01	MG/KG	95% Cheb-m	(3)

Full statistics for data included in Appendix X.
For non-detects, 1/2 sample quantitation limit was used as a proxy concentration; for duplicate sample results, the maximum value was used in the calculation.
ProUCL, Version 2.1 used to determine distribution of data using the Shapiro-Wilk W Test. ProUCL used to calculate RME EPC, following recommendations based on distribution and standard deviation in users guide (USEPA. February 2003. ProUCL, Version 2.1. Prepared by Lockheed Martin Environmental Services).
Statistics: Maximum Detected Value (Max); 95% UCL of Normal Data (95% UCL-N); Mean of Normal Data (Mean-N); 95% UCL of Log-transformed Data, H-Statistic (95% UCL-T); 95% Chebyshev (MVUE) UCL (95% Cheb); 99% Chebyshev (MVUE) UCL (99% Cheb); 95% Chebyshev (mean,std) UCL (95% Cheb-m); 97.5% Chebyshev (mean,std) UCL (97.5% Cheb-m); 99% Chebyshev (mean,std) UCL (99% Cheb-m); Mean of Log-transformed Data (Mean-T).

(1) Shapiro-Wilk W Test indicates data are log-normally distributed.
(2) Shapiro-Wilk W Test indicates data are normally distributed.
(3) Shapiro-Wilk W Test indicates data neither log-normally or normally distributed. Select distribution with higher W Test result.
(4) Shapiro-Wilk W Test indicates data fit both log-normal and normal distribution. Select distribution with higher W Test result.
(5) 95% UCL exceeds maximum detected concentration. Therefore, maximum concentration used for EPC.

N = Normal
T = Log-Transformed
NP = Non-Parametric
J = Estimated Value

Table 3.2.RME
REASONABLE MAXIMUM EXPOSURE
SWMU 6 - Mangrove Disposal Site
NASD, Vieques Island, Puerto Rico

Scenario Timeframe: Future
Medium: Subsurface Soil
Exposure Medium: Subsurface Soil

Exposure Point	Chemical of Potential Concern	Units	Arithmetic Mean	UCL (Distribution)	Maximum Concentration (Qualifier)	Exposure Point Concentration			
						Value	Units	Statistic	Rationale
SWMU 6 Subsurface Soil	ARSENIC	MG/KG	1.28E+00	1.75E+00 (T)	2.20E+00 J	1.75E+00	MG/KG	95% UCL-T	(1)

Full statistics for data included in Appendix X.
For non-detects, 1/2 sample quantitation limit was used as a proxy concentration; for duplicate sample results, the maximum value was used in the calculation.
ProUCL, Version 2.1 used to determine distribution of data using the Shapiro-Wilk W Test. ProUCL used to calculate RME EPC, following recommendations based on distribution and standard deviation in users guide (USEPA. February 2003. ProUCL, Version 2.1. Prepared by Lockheed Martin Environmental Services).
Statistics: Maximum Detected Value (Max); 95% UCL of Normal Data (95% UCL-N); Mean of Normal Data (Mean-N); 95% UCL of Log-transformed Data, H-Statistic (95% UCL-T); 95% Chebyshev (MVUE) UCL (95% Cheb); 99% Chebyshev (MVUE) UCL (99% Cheb); 95% Chebyshev (mean,std) UCL (95% Cheb-m); 97.5% Chebyshev (mean,std) UCL (97.5% Cheb-m); 99% Chebyshev (mean,std) UCL (99% Cheb-m); Mean of Log-transformed Data (Mean-T).

(1) Shapiro-Wilk W Test indicates data are log-normally distributed.
(2) Shapiro-Wilk W Test indicates data are normally distributed.
(3) Shapiro-Wilk W Test indicates data neither log-normally or normally distributed. Select distribution with higher W Test result.
(4) Shapiro-Wilk W Test indicates data fit both log-normal and normal distribution. Select distribution with higher W Test result.
(5) 95% UCL exceeds maximum detected concentration. Therefore, maximum concentration used for EPC.

N = Normal
T = Log-Transformed
NP = Non-Parametric
J = Estimated Value

Table 3.3.RME
REASONABLE MAXIMUM EXPOSURE
SWMU 6 - Mangrove Disposal Site
NASD, Vieques Island, Puerto Rico

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater

Exposure Point	Chemical of Potential Concern	Units	Arithmetic Mean	UCL (Distribution)	Maximum Concentration (Qualifier)	Exposure Point Concentration			
						Value	Units	Statistic	Rationale
Tap Water	CHLOROFORM	UG/L	4.18E-01	7.56E-01 (NP)	1.10E+00	7.56E-01	UG/L	95% Cheb-m	(3)
	PCB-1221 (AROCHLOR 1221)	UG/L	2.26E-01	4.97E-01 (NP)	7.00E-01	4.97E-01	UG/L	95% Cheb-m	(3)
	PCB-1232 (AROCHLOR 1232)	UG/L	1.97E-01	3.63E-01 (NP)	9.00E-02 J	9.00E-02	UG/L	Max	(5)
	Perchlorate	UG/L	1.43E+01	2.12E+01 (NP)	1.28E+01 J	1.28E+01	UG/L	Max	(5)
	ANTIMONY	UG/L	3.04E+01	3.46E+02 (T)	1.04E+02 J	1.04E+02	UG/L	Max	(5)
	ARSENIC	UG/L	3.17E+01	7.68E+01 (T)	1.52E+02 J	7.68E+01	UG/L	95% Cheb	(1)
	BARIUM	UG/L	2.90E+02	4.76E+02 (T)	7.28E+02 J	4.76E+02	UG/L	95% UCL-T	(1)
	CADMIUM	UG/L	3.84E+00	9.01E+00 (NP)	1.42E+01 J	9.01E+00	UG/L	95% Cheb-m	(3)
	CHROMIUM, TOTAL	UG/L	1.25E+01	3.33E+01 (T)	5.88E+01 J	3.33E+01	UG/L	95% UCL-T	(1)
	IRON	UG/L	1.21E+03	7.83E+03 (T)	6.09E+03 J	6.09E+03	UG/L	Max	(5)
	MANGANESE	UG/L	3.55E+03	8.81E+03 (T)	1.43E+04	8.81E+03	UG/L	95% Cheb	(1)
	SELENIUM	UG/L	5.77E+01	2.21E+02 (T)	1.33E+02	1.33E+02	UG/L	Max	(5)
	SILVER	UG/L	8.97E+00	7.11E+01 (T)	5.64E+01 J	5.64E+01	UG/L	Max	(5)
	THALLIUM	UG/L	1.92E+01	6.41E+01 (NP)	6.04E+01 J	6.04E+01	UG/L	Max	(5)

Table 3.3.RME
REASONABLE MAXIMUM EXPOSURE
SWMU 6 - Mangrove Disposal Site
NASD, Vieques Island, Puerto Rico

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater

Full statistics for data included in Appendix X.
For non-detects, 1/2 sample quantitation limit was used as a proxy concentration; for duplicate sample results, the maximum value was used in the calculation.
ProUCL, Version 2.1 used to determine distribution of data using the Shapiro-Wilk W Test. ProUCL used to calculate RME EPC, following recommendations based on distribution and standard deviation in users guide (USEPA. February 2003. ProUCL, Version 2.1. Prepared by Lockheed Martin Environmental Services).
Statistics: Maximum Detected Value (Max); 95% UCL of Normal Data (95% UCL-N); Mean of Normal Data (Mean-N); 95% UCL of Log-transformed Data, H-Statistic (95% UCL-T); 95% Chebyshev (MVUE) UCL (95% Cheb); 99% Chebyshev (MVUE) UCL (99% Cheb); 95% Chebyshev (mean,std) UCL (95% Cheb-m); 97.5% Chebyshev (mean,std) UCL (97.5% Cheb-m); 99% Chebyshev (mean,std) UCL (99% Cheb-m); Mean of Log-transformed Data (Mean-T).

(1) Shapiro-Wilk W Test indicates data are log-normally distributed.
(2) Shapiro-Wilk W Test indicates data are normally distributed.
(3) Shapiro-Wilk W Test indicates data neither log-normally or normally distributed. Select distribution with higher W Test result.
(4) Shapiro-Wilk W Test indicates data fit both log-normal and normal distribution. Select distribution with higher W Test result.
(5) 95% UCL exceeds maximum detected concentration. Therefore, maximum concentration used for EPC.

N = Normal
T = Log-Transformed
NP = Non-Parametric
J = Estimated Value

Table 3.4.RME
REASONABLE MAXIMUM EXPOSURE
SWMU 6 - Mangrove Disposal Site
NASD, Vieques Island, Puerto Rico

Scenario Timeframe: Current/Future
Medium: Sediment
Exposure Medium: Sediment

Exposure Point	Chemical of Potential Concern	Units	Arithmetic Mean	UCL (Distribution)	Maximum Concentration (Qualifier)	Exposure Point Concentration			
						Value	Units	Statistic	Rationale
Kiani Lagoon									
	BENZO(a)PYRENE	MG/KG	4.64E-01	6.58E-01 (T)	7.97E-02 J	7.97E-02	MG/KG	Max	(5)
	ALUMINUM	MG/KG	8.77E+03	1.29E+04 (T)	1.93E+04	1.29E+04	MG/KG	95% UCL-T	(1)
	ANTIMONY	MG/KG	5.67E+00	3.76E+01 (NP)	9.78E+01 J	3.76E+01	MG/KG	97.5% Cheb-m	(3)
	ARSENIC	MG/KG	3.32E+01	2.14E+02 (NP)	5.55E+02	2.14E+02	MG/KG	97.5% Cheb-m	(3)
	BARIUM	MG/KG	3.90E+01	2.24E+02 (NP)	5.71E+02	2.24E+02	MG/KG	97.5% Cheb-m	(3)
	CADMIUM	MG/KG	8.15E-01	5.29E+00 (NP)	1.37E+01	5.29E+00	MG/KG	97.5% Cheb-m	(3)
	CHROMIUM, TOTAL	MG/KG	1.38E+01	2.24E+01 (T)	6.78E+01	2.24E+01	MG/KG	95% UCL-T	(1)
	IRON	MG/KG	1.42E+04	2.17E+04 (NP)	2.57E+04	2.17E+04	MG/KG	95% UCL-T	(1)
	MANGANESE	MG/KG	1.68E+02	2.71E+02 (T)	3.88E+02 J	2.71E+02	MG/KG	95% UCL-T	(1)
	SELENIUM	MG/KG	2.94E+01	2.08E+02 (NP)	5.44E+02	2.08E+02	MG/KG	97.5% Cheb-m	(3)
	THALLIUM	MG/KG	3.05E+01	3.30E+02 (NP)	5.72E+02	3.30E+02	MG/KG	99% Cheb-m	(3)
	VANADIUM	MG/KG	3.55E+01	5.43E+01 (T)	1.74E+02	5.43E+01	MG/KG	95% UCL-T	(1)

Full statistics for data included in Appendix X.

For non-detects, 1/2 sample quantitation limit was used as a proxy concentration; for duplicate sample results, the maximum value was used in the calculation.

ProUCL, Version 2.1 used to determine distribution of data using the Shapiro-Wilk W Test. ProUCL used to calculate RME EPC, following recommendations based on distribution and standard deviation in users guide (USEPA. February 2003. ProUCL, Version 2.1. Prepared by Lockheed Martin Environmental Services).

Statistics: Maximum Detected Value (Max); 95% UCL of Normal Data (95% UCL-N); Mean of Normal Data (Mean-N); 95% UCL of Log-transformed Data, H-Statistic (95% UCL-T); 95% Chebyshev (MVUE) UCL (95% Cheb); 99% Chebyshev (MVUE) UCL (99% Cheb); 95% Chebyshev (mean,std) UCL (95% Cheb-m); 97.5% Chebyshev (mean,std) UCL (97.5% Cheb-m); 99% Chebyshev (mean,std) UCL (99% Cheb-m); Mean of Log-transformed Data (Mean-T).

(1) Shapiro-Wilk W Test indicates data are log-normally distributed.

(2) Shapiro-Wilk W Test indicates data are normally distributed.

(3) Shapiro-Wilk W Test indicates data neither log-normally or normally distributed. Select distribution with higher W Test result.

(4) Shapiro-Wilk W Test indicates data fit both log-normal and normal distribution. Select distribution with higher W Test result.

(5) 95% UCL exceeds maximum detected concentration. Therefore, maximum concentration used for EPC.

N = Normal
T = Log-Transformed
NP = Non-Parametric

J = Estimated Value

Table 3.5.RME
REASONABLE MAXIMUM EXPOSURE
SWMU 6 - Mangrove Disposal Site
NASD, Vieques Island, Puerto Rico

Scenario Timeframe: Future
Medium: Surface Water
Exposure Medium: Surface Water

Exposure Point	Chemical of Potential Concern	Units	Arithmetic Mean	UCL (Distribution)	Maximum Concentration (Qualifier)	Exposure Point Concentration			
						Value	Units	Statistic	Rationale
Kiani Lagoon									
	ARSENIC	UG/L	1.17E+01	2.69E+01 (NP)	5.30E+00 J	5.30E+00	UG/L	Max	(5)
	IRON	UG/L	5.29E+02	1.01E+03 (NP)	1.41E+03 J	1.01E+03	UG/L	95% Cheb-m	(3)
	MERCURY	UG/L	2.15E-01	1.45E+00 (NP)	1.60E+00 J	1.45E+00	UG/L	95% Cheb-m	(3)
	THALLIUM	UG/L	1.36E+01	3.41E+01 (NP)	4.90E+00 J	4.90E+00	UG/L	Max	(5)

Table 3.5.RME
REASONABLE MAXIMUM EXPOSURE
SWMU 6 - Mangrove Disposal Site
NASD, Vieques Island, Puerto Rico

Scenario Timeframe: Future
Medium: Surface Water
Exposure Medium: Surface Water

Full statistics for data included in Appendix X.
For non-detects, 1/2 sample quantitation limit was used as a proxy concentration; for duplicate sample results, the maximum value was used in the calculation.
ProUCL, Version 2.1 used to determine distribution of data using the Shapiro-Wilk W Test. ProUCL used to calculate RME EPC, following recommendations based on distribution and standard deviation in users guide (USEPA. February 2003. ProUCL, Version 2.1. Prepared by Lockheed Martin Environmental Services).
Statistics: Maximum Detected Value (Max); 95% UCL of Normal Data (95% UCL-N); Mean of Normal Data (Mean-N); 95% UCL of Log-transformed Data, H-Statistic (95% UCL-T); 95% Chebyshev (MVUE) UCL (95% Cheb); 99% Chebyshev (MVUE) UCL (99% Cheb); 95% Chebyshev (mean,std) UCL (95% Cheb-m); 97.5% Chebyshev (mean,std) UCL (97.5% Cheb-m); 99% Chebyshev (mean,std) UCL (99% Cheb-m); Mean of Log-transformed Data (Mean-T).

(1) Shapiro-Wilk W Test indicates data are log-normally distributed.
(2) Shapiro-Wilk W Test indicates data are normally distributed.
(3) Shapiro-Wilk W Test indicates data neither log-normally or normally distributed. Select distribution with higher W Test result.
(4) Shapiro-Wilk W Test indicates data fit both log-normal and normal distribution. Select distribution with higher W Test result.
(5) 95% UCL exceeds maximum detected concentration. Therefore, maximum concentration used for EPC.

N = Normal
T = Log-Transformed
NP = Non-Parametric
J = Estimated Value

TABLE 4.1.RME
VALUES USED FOR DAILY INTAKE CALCULATIONS
REASONABLE MAXIMUM EXPOSURE
SWMU 6 - Mangrove Disposal Site
NASD, Vieques Island, Puerto Rico

Scenario Timeframe: Current/Future
Medium: Surface Soil
Exposure Medium: Surface Soil

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Recreational	Adult	SWMU 6 Surface Soil	CS	Chemical Concentration in Soil	See Table 3.1.RME	mg/kg	See Table 3.1.RME	Chronic Daily Intake (CDI) (mg/kg-day) =
				IR-S	Ingestion Rate of Soil	100	mg/day	EPA, 1991	CS x IR-S x EF x ED x CF1 x 1/BW x 1/AT
				EF	Exposure Frequency	104	days/year	(1)	
				ED	Exposure Duration	24	years	EPA, 1991	
				CF	Conversion Factor	0.000001	kg/mg	- -	
				BW	Body Weight	70	kg	EPA, 1991	
				AT-N	Averaging Time (Non-Cancer)	8,760	days	EPA, 1989	
				AT-C	Averaging Time (Cancer)	25,550	days	EPA, 1989	
		Youth	SWMU 6 Surface Soil	CS	Chemical Concentration in Soil	See Table 3.1.RME	mg/kg	See Table 3.1.RME	CDI (mg/kg-day) =
				IR-S	Ingestion Rate of Soil	100	mg/day	EPA, 1991	CS x IR-S x EF x ED x CF1 x 1/BW x 1/AT
				EF	Exposure Frequency	104	days/year	(1)	
				ED	Exposure Duration	10	years	(2)	
				CF	Conversion Factor	0.000001	kg/mg	- -	
				BW	Body Weight	51	kg	EPA, 1997, (3)	
				AT-N	Averaging Time (Non-Cancer)	3,650	days	EPA, 1989	
				AT-C	Averaging Time (Cancer)	25,550	days	EPA, 1989	
		Child	SWMU 6 Surface Soil	CS	Chemical Concentration in Soil	See Table 3.1.RME	mg/kg	See Table 3.1.RME	CDI (mg/kg-day) =
				IR-S	Ingestion Rate of Soil	200	mg/day	EPA, 1991	CS x IR-S x EF x ED x CF1 x 1/BW x 1/AT
				EF	Exposure Frequency	104	days/year	(1)	
				ED	Exposure Duration	6	years	EPA, 1991	
				CF3	Conversion Factor 3	0.000001	kg/mg	- -	
				BW	Body Weight	15	kg	EPA, 1991	
				AT-N	Averaging Time (Non-Cancer)	2,190	days	EPA, 1989	
				AT-C	Averaging Time (Cancer)	25,550	days	EPA, 1989	

TABLE 4.1.RME
VALUES USED FOR DAILY INTAKE CALCULATIONS
REASONABLE MAXIMUM EXPOSURE
SWMU 6 - Mangrove Disposal Site
NASD, Vieques Island, Puerto Rico

Scenario Timeframe: Current/Future
Medium: Surface Soil
Exposure Medium: Surface Soil

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name
Dermal	Recreational	Adult	SWMU 6 Surface Soil	CS	Chemical Concentration in Soil	See Table 3.1.RME	mg/kg	See Table 3.1.RME	CDI (mg/kg-day) =
				SA	Skin Surface Area Available for Contact	5,700	cm^2	EPA, 2001	CS x SA x SSAF x DABS x CF1 x EF x
				SSAF	Soil to Skin Adherence Factor	0.2	mg/cm^2-day	EPA, 2001	ED x 1/BW x 1/AT
				DABS	Dermal Absorption Factor Solids	Chemical Specific	--	EPA, 2001	
				CF	Conversion Factor	0.000001	kg/mg	- -	
				EF	Exposure Frequency	104	days/year	(1)	
				ED	Exposure Duration	24	years	EPA, 1991	
				BW	Body Weight	70	kg	EPA, 1991	
				AT-N	Averaging Time (Non-Cancer)	8,760	days	EPA, 1989	
				AT-C	Averaging Time (Cancer)	25,550	days	EPA, 1989	
		Youth	SWMU 6 Surface Soil	CS	Chemical Concentration in Soil	See Table 3.1.RME	mg/kg	See Table 3.1.RME	CDI (mg/kg-day) =
				SA	Skin Surface Area Available for Contact	4,400	cm^2	EPA, 2001, (4)	CS x SA x SSAF x DABS x CF1 x EF x
				SSAF	Soil to Skin Adherence Factor	0.3	mg/cm^2-day	EPA, 2001, (5)	ED x 1/BW x 1/AT
				DABS	Dermal Absorption Factor Solids	Chemical Specific	--	EPA, 2001	
				CF	Conversion Factor	0.000001	kg/mg	- -	
				EF	Exposure Frequency	104	days/year	(1)	
				ED	Exposure Duration	10	years	(2)	
				BW	Body Weight	51	kg	EPA, 1997, (3)	
				AT-C	Averaging Time (Cancer)	25,550	days	EPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	3,650	days	EPA, 1989	

TABLE 4.1.RME

VALUES USED FOR DAILY INTAKE CALCULATIONS

REASONABLE MAXIMUM EXPOSURE

SWMU 6 - Mangrove Disposal Site

NASD, Vieques Island, Puerto Rico

Scenario Timeframe: Current/Future
Medium: Surface Soil
Exposure Medium: Surface Soil

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name
Dermal	Recreational	Child	SWMU 6 Surface Soil	CS	Chemical Concentration in Soil	See Table 3.1.RME	mg/kg	See Table 3.1.RME	CDI (mg/kg-day) =
				SA	Skin Surface Area Available for Contact	2,800	cm^2	EPA, 2001	CS x SA x SSAF x DABS x CF1 x EF x
				SSAF	Soil to Skin Adherence Factor	0.2	mg/cm^2-day	EPA, 2001	ED x 1/BW x 1/AT
				DABS	Dermal Absorption Factor Solids	Chemical Specific	--	EPA, 2001	
				CF	Conversion Factor	0.000001	kg/mg	- -	
				EF	Exposure Frequency	104	days/year	(1)	
				ED	Exposure Duration	6	years	EPA, 1991	
				BW	Body Weight	15	kg	EPA, 1991	
				AT-C	Averaging Time (Cancer)	25,550	days	EPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	2,190	days	EPA, 1989	

Notes:

(1) Professional judgement assuming 2 days per week for 52 weeks at SWMU 7 for nearby residents trespassing on-site.

(2) Professional judgement assuming adolescents from 9 to 18 years of age.

(3) Body weight is average of the mean values for boys and girls for the ages 9 through 18.

(4) SA is the total of the head, hands, forearms and lower legs for the 8 through 18 year old.

(5) SSAF is the 95th percentile for soil adherence for Soccer Players # 1 (teens).

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1997: Exposure Factors Handbook. EPA/600/P-95/002Fa.

EPA, 2001: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Interim. EPA/540/R/99/005.

TABLE 4.2.RME

VALUES USED FOR DAILY INTAKE CALCULATIONS

REASONABLE MAXIMUM EXPOSURE

SWMU 6 - Mangrove Disposal Site

NASD, Vieques Island, Puerto Rico

Scenario Timeframe: Current/Future
Medium: Surface Soil
Exposure Medium: Air

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name
Inhalation	Recreational	Adult	Emissions from SWMU 6 Surface Soil	CS	Chemical Concentration in Soil	See Table 3.1.RME	mg/kg	See Table 3.1.RME	Chronic Daily Intake (CDI) (mg/kg-day) =
				CA	Chemical Concentration in Air	Calculated	mg/m^3	EPA, 2002	CA x IN x EF x ED x 1/BW x 1/AT
				PEF	Particulate Emission Factor	1.36E+09	m^3/kg	EPA, 2002	
				VF	Volatilization Factor for volatile constituents	Calculated	m^3/kg	EPA, 2002	CA (mg/m^3) = CS (1/PEF + 1/VF)
				IN	Inhalation Rate	20	m^3/day	EPA, 1991	
				EF	Exposure Frequency	104	days/year	(1)	
				ED	Exposure Duration	24	years	EPA, 1991	
				BW	Body Weight	70	kg	EPA, 1991	
				AT-N	Averaging Time (Non-Cancer)	8,760	days	EPA, 1989	
				AT-C	Averaging Time (Cancer)	25,550	days	EPA, 1989	
		Youth	Emissions from SWMU 6 Surface Soil	CS	Chemical Concentration in Soil	See Table 3.1.RME	mg/kg	See Table 3.1.RME	CDI (mg/kg-day) =
				CA	Chemical Concentration in Air	Calculated	mg/m^3	EPA, 2002	CA x IN x EF x ED x 1/BW x 1/AT
				PEF	Particulate Emission Factor	1.36E+09	m^3/kg	EPA, 2002	
				VF	Volatilization Factor for volatile constituents	Calculated	m^3/kg	EPA, 2002	CA (mg/m^3) = CS (1/PEF + 1/VF)
				IN	Inhalation Rate	20	m^3/day	EPA, 1991	
				EF	Exposure Frequency	104	days/year	(1)	
				ED	Exposure Duration	10	years	(2)	
				CF	Conversion Factor	0.000001	kg/mg	- -	
				BW	Body Weight	51	kg	EPA, 1997, (3)	
				AT-N	Averaging Time (Non-Cancer)	3,650	days	EPA, 1989	
				AT-C	Averaging Time (Cancer)	25,550	days	EPA, 1989	

TABLE 4.2.RME

VALUES USED FOR DAILY INTAKE CALCULATIONS

REASONABLE MAXIMUM EXPOSURE

SWMU 6 - Mangrove Disposal Site

NASD, Vieques Island, Puerto Rico

Scenario Timeframe: Current/Future
Medium: Surface Soil
Exposure Medium: Air

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name
Inhalation	Recreational	Child	Emissions from SWMU 6 Surface Soil	CS	Chemical Concentration in Soil	See Table 3.1.RME	mg/kg	See Table 3.1.RME	CDI (mg/kg-day) =
				CA	Chemical Concentration in Air	Calculated	mg/m^3	EPA, 2002	CA x IN x EF x ED x 1/BW x 1/AT
				PEF	Particulate Emission Factor	1.36E+09	m^3/kg	EPA, 2002	
				VF	Volatilization Factor for volatile constituents	Calculated	m^3/kg	EPA, 2002	CA (mg/m^3) = CS (1/PEF + 1/VF)
				IN	Inhalation Rate	15	m^3/day	EPA, 1991	
				EF	Exposure Frequency	104	days/year	(1)	
				ED	Exposure Duration	6	years	EPA, 1991	
				CF3	Conversion Factor 3	0.000001	kg/mg	- -	
				BW	Body Weight	15	kg	EPA, 1991	
				AT-N	Averaging Time (Non-Cancer)	2,190	days	EPA, 1989	
				AT-C	Averaging Time (Cancer)	25,550	days	EPA, 1989	

Notes:

(1) Professional judgement assuming 2 days per week for 52 weeks at SWMU 7 for nearby residents trespassing on-site.

(2) Professional judgement assuming adolescents from 9 to 18 years of age.

(3) Body weight is average of the mean values for boys and girls for the ages 9 through 18.

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1997: Exposure Factors Handbook. EPA/600/P-95/002Fa.

EPA, 2002: Supplemental Guidance for Developing Soil Screening Levels for Superfund Sites, OSWER 9355.4-24, December, 2002.

TABLE 4.3.RME

VALUES USED FOR DAILY INTAKE CALCULATIONS

REASONABLE MAXIMUM EXPOSURE

SWMU 6 - Mangrove Disposal Site

NASD, Vieques Island, Puerto Rico

Scenario Timeframe: Current/Future
Medium: Sediment
Exposure Medium: Sediment

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Recreational	Adult	Kaiun Lagoon	Csed	Chemical Concentration in Sediment	See Table 3.4.RME	mg/kg	See Table 3.4.RME	Chronic Daily Intake (CDI) (mg/kg-day) =
				IR-Sed	Ingestion Rate of Sediment	50	mg/day	(1)	CSed x IR-Sed x EF x ED x CF x 1/BW x 1/AT
				EF	Exposure Frequency	52	days/year	(2)	
				ED	Exposure Duration	24	years	EPA, 1991	
				CF	Conversion Factor	0.000001	kg/mg	- -	
				BW	Body Weight	70	kg	EPA, 1991	
				AT-N	Averaging Time (Non-Cancer)	8,760	days	EPA, 1989	
				AT-C	Averaging Time (Cancer)	25,550	days	EPA, 1989	
		Youth	Kiani Lagoon	Csed	Chemical Concentration in Sediment	See Table 3.4.RME	mg/kg	See Table 3.4.RME	CDI (mg/kg-day) =
				IR-Sed	Ingestion Rate of Sediment	50	mg/day	(1)	CS x IR-S x EF x ED x CF x 1/BW x 1/AT
				EF	Exposure Frequency	52	days/year	(2)	
				ED	Exposure Duration	10	years	(3)	
				CF	Conversion Factor	0.000001	kg/mg	- -	
				BW	Body Weight	51	kg	EPA, 1991, (4)	
				AT-N	Averaging Time (Non-Cancer)	3,650	days	EPA, 1989	
				AT-C	Averaging Time (Cancer)	25,550	days	EPA, 1989	
		Child	Kiani Lagoon	Csed	Chemical Concentration in Sediment	See Table 3.4.RME	mg/kg	See Table 3.4.RME	CDI (mg/kg-day) =
				IR-Sed	Ingestion Rate of Sediment	100	mg/day	(1)	CS x IR-S x EF x ED x CF x 1/BW x 1/AT
				EF	Exposure Frequency	52	days/year	(2)	
				ED	Exposure Duration	6	years	EPA, 1991	
				CF	Conversion Factor	0.000001	kg/mg	- -	
				BW	Body Weight	15	kg	EPA, 1991	
				AT-N	Averaging Time (Non-Cancer)	2,190	days	EPA, 1989	
				AT-C	Averaging Time (Cancer)	25,550	days	EPA, 1989	

TABLE 4.3.RME

VALUES USED FOR DAILY INTAKE CALCULATIONS

REASONABLE MAXIMUM EXPOSURE

SWMU 6 - Mangrove Disposal Site

NASD, Vieques Island, Puerto Rico

Scenario Timeframe: Current/Future
Medium: Sediment
Exposure Medium: Sediment

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name
Dermal	Recreational	Adult	Kiani Lagoon	Csed	Chemical Concentration in Sediment	See Table 3.4.RME	mg/kg	See Table 3.4.RME	CDI (mg/kg-day) =
				SA	Skin Surface Area Available for Contact	5,170	cm^2	EPA, 1997, (5)	CSed x SA x SSAF x DABS x CF x EF x
				SSAF	Soil to Skin Adherence Factor	0.36	mg/cm^2-day	EPA, 1997, (6)	ED x 1/BW x 1/AT
				DABS	Dermal Absorption Factor Solids	Chemical Specific	--	EPA, 2001	
				CF	Conversion Factor	0.000001	kg/mg	- -	
				EF	Exposure Frequency	52	days/year	(1)	
				ED	Exposure Duration	24	years	(2)	
				BW	Body Weight	70	kg	EPA, 1991	
				AT-N	Averaging Time (Non-Cancer)	8,760	days	EPA, 1989	
				AT-C	Averaging Time (Cancer)	25,550	days	EPA, 1989	
		Youth	Kiani Lagoon	Csed	Chemical Concentration in Sediment	See Table 3.4.RME	mg/kg	See Table 3.4.RME	CDI (mg/kg-day) =
				SA	Skin Surface Area Available for Contact	4,000	cm^2	EPA, 1997, (7)	CSed x SA x SSAF x DABS x CF x EF x
				SSAF	Soil to Skin Adherence Factor	0.36	mg/cm^2-day	EPA, 1997, (6)	ED x 1/BW x 1/AT
				DABS	Dermal Absorption Factor Solids	Chemical Specific	--	EPA, 2001	
				CF	Conversion Factor	0.000001	kg/mg	- -	
				EF	Exposure Frequency	52	days/year	(1)	
				ED	Exposure Duration	10	years	(3)	
				BW	Body Weight	51	kg	EPA, 1991, (4)	
				AT-N	Averaging Time (Non-Cancer)	3,650	days	EPA, 1989	
				AT-C	Averaging Time (Cancer)	25,550	days	EPA, 1989	

TABLE 4.3.RME

VALUES USED FOR DAILY INTAKE CALCULATIONS

REASONABLE MAXIMUM EXPOSURE

SWMU 6 - Mangrove Disposal Site

NASD, Vieques Island, Puerto Rico

Scenario Timeframe: Current/Future
Medium: Sediment
Exposure Medium: Sediment

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name
Dermal	Recreational	Child	Kiani Lagoon	Csed	Chemical Concentration in Sediment	See Table 3.4.RME	mg/kg	See Table 3.4.RME	CDI (mg/kg-day) =
				SA	Skin Surface Area Available for Contact	2,000	cm^2	EPA, 1997, (8)	CSed x SA x SSAF x DABS x CF x EF x
				SSAF	Soil to Skin Adherence Factor	0.36	mg/cm^2-day	EPA, 1997, (6)	ED x 1/BW x 1/AT
				DABS	Dermal Absorption Factor Solids	Chemical Specific	--	EPA, 2001	
				CF	Conversion Factor	0.000001	kg/mg	- -	
				EF	Exposure Frequency	52	days/year	(1)	
				ED	Exposure Duration	6	years	EPA, 1991	
				BW	Body Weight	15	kg	EPA, 1991	
				AT-N	Averaging Time (Non-Cancer)	2,190	days	EPA, 1989	
				AT-C	Averaging Time (Cancer)	25,550	days	EPA, 1989	

Notes:

(1) Professional judgement assuming 1/2 the default value for the residential soil scenario.

(2) Professional judgement assuming 1 day per week for 52 weeks per year.

(3) Professional Judgement assuming adolescents from 9 to 18 years of age.

(4) Body weight is average value for the 6 year old and 18 year old male body weight.

(5) SA is the sum of the mean surface areas (for a male) of the hands, forearms, feet, and lower legs.

(6) SSAF is soil adherence to legs for Rugby No. 1 from EPA, 1997, Table 6-12.

(7) Surface area is 25% of total surface area (95 percentile) for 6 to 18 year old children.

(8) Surface area is 25% of total surface area (95 percentile) for 0 to 6 year old children.

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1997: Exposure Factors Handbook. EPA/600/P-95/002Fa.

EPA, 2001: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Interim. EPA/540/R/99/005.

TABLE 4.4.RME

VALUES USED FOR DAILY INTAKE CALCULATIONS

REASONABLE MAXIMUM EXPOSURE

SWMU 6 - Mangrove Disposal Site

NASD, Vieques Island, Puerto Rico

Scenario Timeframe: Current/Future
Medium: Surface Water
Exposure Medium: Surface Water

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Recreational	Adult	Kiani Lagoon	CSW	Chemical Concentration in Surface Water	See Table 3.5.RME	µg/l	See Table 3.5.RME	Chronic Daily Intake (CDI) (mg/kg-day) =
				IR-SW	Ingestion Rate of Surface Water	0.025	l/hour	EPA, 1989, (1)	CSW x IR-SW x ET x EF x ED x CF1 x
				ET	Exposure Time	2.6	hr/day	EPA, 1989	1/BW x 1/AT
				EF	Exposure Frequency	52	days/year	(2)	
				ED	Exposure Duration	24	years	EPA, 1991	
				CF1	Conversion Factor 1	0.001	mg/µg	- -	
				BW	Body Weight	70	kg	EPA, 1991	
				AT-N	Averaging Time (Non-Cancer)	8,760	days	EPA, 1989	
				AT-C	Averaging Time (Cancer)	25,550	days	EPA, 1989	
		Youth	Kiani Lagoon	CSW	Chemical Concentration in Surface Water	See Table 3.5.RME	µg/l	See Table 3.5.RME	CDI (mg/kg-day) =
				IR-SW	Ingestion Rate of Surface Water	0.025	l/hour	EPA, 1989, (1)	CSW x IR-SW x ET x EF x ED x CF1 x
				ET	Exposure Time	2.6	hr/day	EPA, 1989	1/BW x 1/AT
				EF	Exposure Frequency	52	days/year	(2)	
				ED	Exposure Duration	10	years	(3)	
				CF1	Conversion Factor 1	0.001	mg/µg	- -	
				BW	Body Weight	51	kg	EPA, 1997, (4)	
				AT-N	Averaging Time (Non-Cancer)	3,650	EPA, 1989	EPA, 1989	
				AT-C	Averaging Time (Cancer)	25,550	EPA, 1989	EPA, 1989	
		Child	Kiani Lagoon	CSW	Chemical Concentration in Surface Water	See Table 3.5.RME	µg/l	See Table 3.5.RME	CDI (mg/kg-day) =
				IR-SW	Ingestion Rate of Surface Water	0.025	l/hour	EPA, 1989, (1)	CSW x IR-SW x ET x EF x ED x CF1 x
				ET	Exposure Time	2.6	hr/day	EPA, 1989	1/BW x 1/AT
				EF	Exposure Frequency	52	days/year	(2)	
				ED	Exposure Duration	6	years	EPA, 1991	
				CF1	Conversion Factor 1	0.001	mg/µg	- -	
				BW	Body Weight	15	kg	EPA, 1991	
				AT-N	Averaging Time (Non-Cancer)	2,190	EPA, 1989	EPA, 1989	
				AT-C	Averaging Time (Cancer)	25,550	EPA, 1989	EPA, 1989	

TABLE 4.4.RME

VALUES USED FOR DAILY INTAKE CALCULATIONS

REASONABLE MAXIMUM EXPOSURE

SWMU 6 - Mangrove Disposal Site

NASD, Vieques Island, Puerto Rico

Scenario Timeframe: Current/Future
Medium: Surface Water
Exposure Medium: Surface Water

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name
Dermal	Recreational	Adult	Kiani Lagoon	CSW	Chemical Concentration in Surface Water	See Table 3.5.RME	µg/l	See Table 3.5.RME	CDI (mg/kg-day) =
				DAevent	Dermally Absorbed Dose per Event	calculated	mg/cm^2-event	calculated	DAevent x SA x EV x EF x ED x 1/BW x 1/AT
				FA	Fraction absorbed water	Chemical Specific	dimensionless	EPA, 2001	
				Kp	Permeability Coefficient	Chemical Specific	cm/hr	EPA, 2001	Inorganics: DAevent (mg/cm^2-event) =
				τ	Lag Time	Chemical Specific	hr/event	EPA, 2001	Kp x CW x t_{event} x CF1 x CF2
				t*	Time to Reach Steady-state	Chemical Specific	hours	EPA, 2001	
				B	Ratio of Permeability of Stratum Corneum to Epidermis	Chemical Specific	dimensionless	EPA, 2001	Organics :
				t_{event}	Event Time	2.6	hr/event	EPA, 1989	t_{event}<t*: DAevent (mg/cm^2-event) =
				SA	Skin Surface Area Available for Contact	5,170	cm^2	EPA, 1997, (5)	2 x FA x Kp x CW x (sqrt((6 x τ x t_{event})/ π))
				EV	Event Frequency	1	events/day	EPA, 2001	x CF1 x CF2
				EF	Exposure Frequency	52	days/year	(2)	
				ED	Exposure Duration	24	years	EPA, 1991	t_{event}>t*: DAevent (mg/cm^2-event) =
				BW	Body Weight	70	kg	EPA, 1991	FA x Kp x CW x (t_{event}/(1+B) + 2 x τ x
				AT-N	Averaging Time (Non-Cancer)	8,760	days	EPA, 1989	((1 + 3B + $3B^2$)/$(1+B)^2$)) x CF1 x CF2
				AT-C	Averaging Time (Cancer)	25,550	days	EPA, 1989	
				CF1	Conversion Factor 1	0.001	mg/µg	- -	
				CF2	Conversion Factor 2	0.001	l/cm^3	- -	

TABLE 4.4.RME

VALUES USED FOR DAILY INTAKE CALCULATIONS

REASONABLE MAXIMUM EXPOSURE

SWMU 6 - Mangrove Disposal Site

NASD, Vieques Island, Puerto Rico

Scenario Timeframe: Current/Future
Medium: Surface Water
Exposure Medium: Surface Water

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name
Dermal	Recreational	Youth	Kiani Lagoon	CSW	Chemical Concentration in Surface Water	See Table 3.5.RME	µg/l	See Table 3.5.RME	CDI (mg/kg-day) =
				DAevent	Dermally Absorbed Dose per Event	calculated	mg/cm^2-event	calculated	DAevent x SA x EV x EF x ED x 1/BW x 1/AT
				FA	Fraction absorbed water	Chemical Specific	dimensionless	EPA, 2001	
				Kp	Permeability Coefficient	Chemical Specific	cm/hr	EPA, 2001	Inorganics: DAevent (mg/cm^2-event) =
				τ	Lag Time	Chemical Specific	hr/event	EPA, 2001	Kp x CW x t_{event} x CF1 x CF2
				t*	Time to Reach Steady-state	Chemical Specific	hours	EPA, 2001	
				B	Ratio of Permeability of Stratum Corneum to Epidermis	Chemical Specific	dimensionless	EPA, 2001	Organics :
				t_{event}	Event Time	2.6	hr/event	EPA, 1989	t_{event}<t*: DAevent (mg/cm^2-event) =
				SA	Skin Surface Area Available for Contact	4,000	cm^2	EPA, 1997, (6)	2 x FA x Kp x CW x (sqrt((6 x τ x t_{event})/ π))
				EV	Event Frequency	1	events/day	EPA, 2001	x CF1 x CF2
				EF	Exposure Frequency	52	days/year	(2)	
				ED	Exposure Duration	10	years	(3)	t_{event}>t*: DAevent (mg/cm^2-event) =
				BW	Body Weight	51	kg	EPA, 1997, (4)	FA x Kp x CW x (t_{event}/(1+B) + 2 x τ x
				AT-N	Averaging Time (Non-Cancer)	3,650	EPA, 1989	EPA, 1989	((1 + 3B + $3B^2$)/$(1+B)^2$)) x CF1 x CF2
				AT-C	Averaging Time (Cancer)	25,550	EPA, 1989	EPA, 1989	
				CF1	Conversion Factor 1	0.001	mg/µg	- -	
				CF2	Conversion Factor 2	0.001	l/cm^3	- -	

TABLE 4.4.RME

VALUES USED FOR DAILY INTAKE CALCULATIONS

REASONABLE MAXIMUM EXPOSURE

SWMU 6 - Mangrove Disposal Site

NASD, Vieques Island, Puerto Rico

Scenario Timeframe: Current/Future
Medium: Surface Water
Exposure Medium: Surface Water

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name
Dermal	Recreational	Child	Kiani Lagoon	CSW	Chemical Concentration in Surface Water	See Table 3.5.RME	µg/l	See Table 3.5.RME	CDI (mg/kg-day) =
				DAevent	Dermally Absorbed Dose per Event	calculated	mg/cm^2-event	calculated	DAevent x SA x EV x EF x ED x 1/BW x 1/AT
				FA	Fraction absorbed water	Chemical Specific	dimensionless	EPA, 2001	
				Kp	Permeability Coefficient	Chemical Specific	cm/hr	EPA, 2001	Inorganics: DAevent (mg/cm^2-event) =
				τ	Lag Time	Chemical Specific	hr/event	EPA, 2001	Kp x CW x t_{event} x CF1 x CF2
				t*	Time to Reach Steady-state	Chemical Specific	hours	EPA, 2001	
				B	Ratio of Permeability of Stratum Corneum to Epidermis	Chemical Specific	dimensionless	EPA, 2001	Organics :
				t_{event}	Event Time	2.6	hr/event	EPA, 1989	t_{event}<t*: DAevent (mg/cm^2-event) =
				SA	Skin Surface Area Available for Contact	2,000	cm^2	EPA, 1997, (7)	2 x FA x Kp x CW x (sqrt((6 x τ x t_{event})/ π))
				EV	Event Frequency	1	events/day	EPA, 2001	x CF1 x CF2
				EF	Exposure Frequency	52	days/year	(2)	
				ED	Exposure Duration	6	years	EPA, 1991	t_{event}>t*: DAevent (mg/cm^2-event) =
				BW	Body Weight	15	kg	EPA, 1991	FA x Kp x CW x (t_{event}/(1+B) + 2 x τ x
				AT-N	Averaging Time (Non-Cancer)	2,190	EPA, 1989	EPA, 1989	((1 + 3B + $3B^2$)/$(1+B)^3$)) x CF1 x CF2
				AT-C	Averaging Time (Cancer)	25,550	EPA, 1989	EPA, 1989	
				CF1	Conversion Factor 1	0.001	mg/µg	- -	
				CF2	Conversion Factor 2	0.001	l/cm^3	- -	

Notes:

(1) Professional Judgment assuming one half of the ingestion rate specified for swimming.

(2) Professional Judgement assuming 1 day per week for 52 weeks per year.

(3) Professional Judgement assuming adolescents from 9 to 18 years of age.

(4) Body weight is average value for the 6 year old and 18 year old male body weight.

(5) SA is the sum of the mean surface areas (for a male) of the hands, forearms, feet, and lower legs.

(6) Surface area is 25% of total surface area (95 percentile) for 6 to 18 year old children.

(7) Surface area is 25% of total surface area (95 percentile) for 0 to 6 year old children.

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1997: Exposure Factors Handbook. EPA/600/P-95/002Fa.

EPA, 2001: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Interim. EPA/540/R/99/005.

TABLE 4.5.RME

VALUES USED FOR DAILY INTAKE CALCULATIONS

REASONABLE MAXIMUM EXPOSURE

SWMU 6 - Mangrove Disposal Site

NASD, Vieques Island, Puerto Rico

Scenario Timeframe: Future
Medium: Surface Soil
Exposure Medium: Surface Soil

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Residential	Adult	SWMU 6 Surface Soil	CS	Chemical Concentration in Soil	See Table 3.1.RME	mg/kg	See Table 3.1.RME	Chronic Daily Intake (CDI) (mg/kg-day) =
				IR-S	Ingestion Rate of Soil	100	mg/day	EPA, 1991	CS x IR-S x EF x ED x CF1 x 1/BW x 1/AT
				EF	Exposure Frequency	350	days/year	EPA, 1991	
				ED	Exposure Duration	24	years	EPA, 1991	
				CF	Conversion Factor	0.000001	kg/mg	- -	
				BW	Body Weight	70	kg	EPA, 1991	
				AT-N	Averaging Time (Non-Cancer)	8,760	days	EPA, 1989	
				AT-C	Averaging Time (Cancer)	25,550	days	EPA, 1989	
		Child	SWMU 6 Surface Soil	CS	Chemical Concentration in Soil	See Table 3.1.RME	mg/kg	See Table 3.1.RME	CDI (mg/kg-day) =
				IR-S	Ingestion Rate of Soil	200	mg/day	EPA, 1991	CS x IR-S x EF x ED x CF1 x 1/BW x 1/AT
				EF	Exposure Frequency	350	days/year	EPA, 1991	
				ED	Exposure Duration	6	years	EPA, 1991	
				CF3	Conversion Factor 3	0.000001	kg/mg	- -	
				BW	Body Weight	15	kg	EPA, 1991	
				AT-N	Averaging Time (Non-Cancer)	2,190	days	EPA, 1989	
				AT-C	Averaging Time (Cancer)	25,550	days	EPA, 1989	
	Maintenance Worker	Adult	SWMU 6 Surface Soil	CS	Chemical Concentration in Soil	See Table 3.1.RME	mg/kg	See Table 3.1.RME	CDI (mg/kg-day) =
				IR-S	Ingestion Rate of Soil	100	mg/day	EPA, 1991	CS x IR-S x EF x ED x CF1 x 1/BW x 1/AT
				EF	Exposure Frequency	52	days/year	(1)	
				ED	Exposure Duration	25	years	EPA, 1991	
				CF1	Conversion Factor 1	0.000001	kg/mg	- -	
				BW	Body Weight	70	kg	EPA, 1991	
				AT-C	Averaging Time (Cancer)	25,550	days	EPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	9,125	days	EPA, 1989	

TABLE 4.5.RME

VALUES USED FOR DAILY INTAKE CALCULATIONS

REASONABLE MAXIMUM EXPOSURE

SWMU 6 - Mangrove Disposal Site

NASD, Vieques Island, Puerto Rico

Scenario Timeframe: Future
Medium: Surface Soil
Exposure Medium: Surface Soil

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Industrial Worker	Adult	SWMU 6 Surface Soil	CS	Chemical Concentration in Soil	See Table 3.1.RME	mg/kg	See Table 3.1.RME	CDI (mg/kg-day) =
				IR-S	Ingestion Rate of Soil	100	mg/day	EPA, 1991	CS x IR-S x EF x ED x CF1 x 1/BW x 1/AT
				EF	Exposure Frequency	250	days/year	EPA, 1991	
				ED	Exposure Duration	25	years	EPA, 1991	
				CF1	Conversion Factor 1	0.000001	kg/mg	- -	
				BW	Body Weight	70	kg	EPA, 1991	
				AT-C	Averaging Time (Cancer)	25,550	days	EPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	9,125	days	EPA, 1989	
Dermal	Residential	Adult	SWMU 6 Surface Soil	CS	Chemical Concentration in Soil	See Table 3.1.RME	mg/kg	See Table 3.1.RME	CDI (mg/kg-day) =
				SA	Skin Surface Area Available for Contact	5,700	cm^2	EPA, 2001	CS x SA x SSAF x DABS x CF1 x EF x
				SSAF	Soil to Skin Adherence Factor	0.07	mg/cm^2-day	EPA, 2001	ED x 1/BW x 1/AT
				DABS	Dermal Absorption Factor Solids	Chemical Specific	--	EPA, 2001	
				CF	Conversion Factor	0.000001	kg/mg	- -	
				EF	Exposure Frequency	350	days/year	EPA, 1991	
				ED	Exposure Duration	24	years	EPA, 1991	
				BW	Body Weight	70	kg	EPA, 1991	
				AT-N	Averaging Time (Non-Cancer)	8,760	days	EPA, 1989	
				AT-C	Averaging Time (Cancer)	25,550	days	EPA, 1989	
		Child	SWMU 6 Surface Soil	CS	Chemical Concentration in Soil	See Table 3.1.RME	mg/kg	See Table 3.1.RME	CDI (mg/kg-day) =
				SA	Skin Surface Area Available for Contact	2,800	cm^2	EPA, 2001	CS x SA x SSAF x DABS x CF1 x EF x
				SSAF	Soil to Skin Adherence Factor	0.2	mg/cm^2-day	EPA, 2001	ED x 1/BW x 1/AT
				DABS	Dermal Absorption Factor Solids	Chemical Specific	--	EPA, 2001	
				CF	Conversion Factor	0.000001	kg/mg	- -	
				EF	Exposure Frequency	350	days/year	EPA, 1991	
				ED	Exposure Duration	6	years	EPA, 1991	
				BW	Body Weight	15	kg	EPA, 1991	
				AT-C	Averaging Time (Cancer)	25,550	days	EPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	2,190	days	EPA, 1989	

TABLE 4.5.RME

VALUES USED FOR DAILY INTAKE CALCULATIONS

REASONABLE MAXIMUM EXPOSURE

SWMU 6 - Mangrove Disposal Site

NASD, Vieques Island, Puerto Rico

Scenario Timeframe: Future
Medium: Surface Soil
Exposure Medium: Surface Soil

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name
Dermal	Maintenance Worker	Adult	SWMU 6 Surface Soil	CS	Chemical Concentration in Soil	See Table 3.1.RME	mg/kg	See Table 3.1.RME	CDI (mg/kg-day) =
				SA	Skin Surface Area Available for Contact	3,300	cm^2	EPA, 2001, (2)	CS x SA x SSAF x DABS x CF1 x EF x
				SSAF	Soil to Skin Adherence Factor	0.2	mg/cm^2-day	EPA, 2001, (3)	ED x 1/BW x 1/AT
				DABS	Dermal Absorption Factor Solids	Chemical Specific	--	EPA, 2001	
				CF1	Conversion Factor 1	0.000001	kg/mg	- -	
				EF	Exposure Frequency	52	days/year	(1)	
				ED	Exposure Duration	25	years	EPA, 1991	
				BW	Body Weight	70	kg	EPA, 1991	
				AT-C	Averaging Time (Cancer)	25,550	days	EPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	9,125	days	EPA, 1989	
	Industrial Worker	Adult	SWMU 6 Surface Soil	CS	Chemical Concentration in Soil	See Table 3.1.RME	mg/kg	See Table 3.1.RME	CDI (mg/kg-day) =
				SA	Skin Surface Area Available for Contact	3,300	cm^2	EPA, 2001, (2)	CS x SA x SSAF x DABS x CF1 x EF x
				SSAF	Soil to Skin Adherence Factor	0.2	mg/cm^2-day	EPA, 2001, (3)	ED x 1/BW x 1/AT
				DABS	Dermal Absorption Factor Solids	Chemical Specific	--	EPA, 2001	
				CF1	Conversion Factor 1	0.000001	kg/mg	- -	
				EF	Exposure Frequency	250	days/year	EPA, 1991	
				ED	Exposure Duration	25	years	EPA, 1991	
				BW	Body Weight	70	kg	EPA, 1991	
				AT-C	Averaging Time (Cancer)	25,550	days	EPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	9,125	days	EPA, 1989	

Notes:

(1) Conservative assumption based on potential maintenance activities (i.e., lawn mowing) at the site, 2 days per week for 26 weeks.

(2) Worker assumed to wear a short-sleeved shirt, long pants, and shoes therefore, the exposed surface area is face, hands and forearms.

(3) SSAF based on maximum adherence factor for utility workers.

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 2001: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Interim. EPA/540/R/99/005.

TABLE 4.6.RME
VALUES USED FOR DAILY INTAKE CALCULATIONS
REASONABLE MAXIMUM EXPOSURE
SWMU 6 - Mangrove Disposal Site
NASD, Vieques Island, Puerto Rico

Scenario Timeframe: Future
Medium: Surface Soil
Exposure Medium: Air

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name
Inhalation	Residential	Adult	Emissions from SWMU 6 Surface Soil	CS	Chemical Concentration in Soil	See Table 3.1.RME	mg/kg	See Table 3.1.RME	Chronic Daily Intake (CDI) (mg/kg-day) =
				CA	Chemical Concentration in Air	Calculated	mg/m^3	EPA, 2002	CA x IN x EF x ED x 1/BW x 1/AT
				PEF	Particulate Emission Factor	1.36E+09	m^3/kg	EPA, 2002	
				VF	Volatilization Factor for volatile constituents	Calculated	m^3/kg	EPA, 2002	CA (mg/m^3) = CS (1/PEF + 1/VF)
				IN	Inhalation Rate	20	m^3/day	EPA, 1991	
				EF	Exposure Frequency	350	days/year	EPA, 1991	
				ED	Exposure Duration	24	years	EPA, 1991	
				BW	Body Weight	70	kg	EPA, 1991	
				AT-N	Averaging Time (Non-Cancer)	8,760	days	EPA, 1989	
				AT-C	Averaging Time (Cancer)	25,550	days	EPA, 1989	
		Child	Emissions from SWMU 6 Surface Soil	CS	Chemical Concentration in Soil	See Table 3.1.RME	mg/kg	See Table 3.1.RME	CDI (mg/kg-day) =
				CA	Chemical Concentration in Air	Calculated	mg/m^3	EPA, 2002	CA x IN x EF x ED x 1/BW x 1/AT
				PEF	Particulate Emission Factor	1.36E+09	m^3/kg	EPA, 2002	
				VF	Volatilization Factor for volatile constituents	Calculated	m^3/kg	EPA, 2002	CA (mg/m^3) = CS (1/PEF + 1/VF)
				IN	Inhalation Rate	15	m^3/day	EPA, 1991	
				EF	Exposure Frequency	350	days/year	EPA, 1991	
				ED	Exposure Duration	6	years	EPA, 1991	
				CF3	Conversion Factor 3	0.000001	kg/mg	- -	
				BW	Body Weight	15	kg	EPA, 1991	
				AT-N	Averaging Time (Non-Cancer)	2,190	days	EPA, 1989	
				AT-C	Averaging Time (Cancer)	25,550	days	EPA, 1989	

TABLE 4.6.RME

VALUES USED FOR DAILY INTAKE CALCULATIONS

REASONABLE MAXIMUM EXPOSURE

SWMU 6 - Mangrove Disposal Site

NASD, Vieques Island, Puerto Rico

Scenario Timeframe: Future
Medium: Surface Soil
Exposure Medium: Air

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name
Inhalation	Maintenance Worker	Adult	Emissions from SWMU 6 Surface Soil	CS	Chemical Concentration in Soil	See Table 3.1.RME	mg/kg	See Table 3.1.RME	CDI (mg/kg-day) =
				CA	Chemical Concentration in Air	Calculated	mg/m^3	EPA, 2002	CA x IN x EF x ED x 1/BW x 1/AT
				PEF	Particulate Emission Factor	1.36E+09	m^3/kg	EPA, 2002	
				VF	Volatilization Factor for volatile constituents	Calculated	m^3/kg	EPA, 2002	CA (mg/m^3) = CS (1/PEF + 1/VF)
				IN	Inhalation Rate	20	m^3/day	EPA, 1991	
				EF	Exposure Frequency	52	days/year	(1)	
				ED	Exposure Duration	25	years	EPA, 1991	
				BW	Body Weight	70	kg	EPA, 1991	
				AT-N	Averaging Time (Non-Cancer)	9,125	days	EPA, 1989	
				AT-C	Averaging Time (Cancer)	25,550	days	EPA, 1989	
	Industrial Worker	Adult	Emissions from SWMU 6 Surface Soil	CS	Chemical Concentration in Soil	See Table 3.1.RME	mg/kg	See Table 3.1.RME	CDI (mg/kg-day) =
				CA	Chemical Concentration in Air	Calculated	mg/m^3	EPA, 2002	CA x IN x EF x ED x 1/BW x 1/AT
				PEF	Particulate Emission Factor	1.36E+09	m^3/kg	EPA, 2002	
				VF	Volatilization Factor for volatile constituents	Calculated	m^3/kg	EPA, 2002	CA (mg/m^3) = CS (1/PEF + 1/VF)
				IN	Inhalation Rate	20	m^3/day	EPA, 1991	
				EF	Exposure Frequency	250	days/year	EPA, 1991	
				ED	Exposure Duration	25	years	EPA, 1991	
				BW	Body Weight	70	kg	EPA, 1991	
				AT-N	Averaging Time (Non-Cancer)	9,125	days	EPA, 1989	
				AT-C	Averaging Time (Cancer)	25,550	days	EPA, 1989	

Notes:

(1) Conservative assumption based on potential maintenance activities (i.e., lawn mowing) at the site, 2 days per week for 26 weeks.

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 2002: Supplemental Guidance for Developing Soil Screening Levels for Superfund Sites, OSWER 9355.4-24, December, 2002.

TABLE 4.7.RME
VALUES USED FOR DAILY INTAKE CALCULATIONS
REASONABLE MAXIMUM EXPOSURE
SWMU 6 - Mangrove Disposal Site
NASD, Vieques Island, Puerto Rico

Scenario Timeframe: Future
Medium: Subsurface Soil
Exposure Medium: Subsurface Soil

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Residential	Adult	SWMU 6 Subsurface Soil	CS	Chemical Concentration in Soil	See Table 3.2.RME	mg/kg	See Table 3.2.RME	Chronic Daily Intake (CDI) (mg/kg-day) =
				IR-S	Ingestion Rate of Soil	100	mg/day	EPA, 1991	CS x IR-S x EF x ED x CF1 x 1/BW x 1/AT
				EF	Exposure Frequency	350	days/year	EPA, 1991	
				ED	Exposure Duration	24	years	EPA, 1991	
				CF	Conversion Factor	0.000001	kg/mg	- -	
				BW	Body Weight	70	kg	EPA, 1991	
				AT-N	Averaging Time (Non-Cancer)	8,760	days	EPA, 1989	
				AT-C	Averaging Time (Cancer)	25,550	days	EPA, 1989	
		Child	SWMU 6 Subsurface Soil	CS	Chemical Concentration in Soil	See Table 3.2.RME	mg/kg	See Table 3.2.RME	CDI (mg/kg-day) =
				IR-S	Ingestion Rate of Soil	200	mg/day	EPA, 1991	CS x IR-S x EF x ED x CF1 x 1/BW x 1/AT
				EF	Exposure Frequency	350	days/year	EPA, 1991	
				ED	Exposure Duration	6	years	EPA, 1991	
				CF3	Conversion Factor 3	0.000001	kg/mg	- -	
				BW	Body Weight	15	kg	EPA, 1991	
				AT-N	Averaging Time (Non-Cancer)	2,190	days	EPA, 1989	
				AT-C	Averaging Time (Cancer)	25,550	days	EPA, 1989	
	Construction Worker	Adult	SWMU 6 Subsurface Soil	CS	Chemical Concentration in Soil	See Table 3.2.RME	mg/kg	See Table 3.2.RME	Chronic Daily Intake (CDI) (mg/kg-day) =
				IR-S	Ingestion Rate of Soil	330	mg/day	EPA, 2002	CS x IR-S x EF x ED x CF1 x 1/BW x 1/AT
				EF	Exposure Frequency	250	days/year	EPA, 1989	
				ED	Exposure Duration	0.5	years	(1)	
				CF1	Conversion Factor 1	0.000001	kg/mg	- -	
				BW	Body Weight	70	kg	EPA, 1991	
				AT-N	Averaging Time (Non-Cancer)	183	days	EPA, 1989	
				AT-C	Averaging Time (Cancer)	25,550	days	EPA, 1989	
Dermal	Residential	Adult	SWMU 6 Subsurface Soil	CS	Chemical Concentration in Soil	See Table 3.2.RME	mg/kg	See Table 3.2.RME	CDI (mg/kg-day) =

TABLE 4.7.RME
VALUES USED FOR DAILY INTAKE CALCULATIONS
REASONABLE MAXIMUM EXPOSURE
SWMU 6 - Mangrove Disposal Site
NASD, Vieques Island, Puerto Rico

Scenario Timeframe: Future
Medium: Subsurface Soil
Exposure Medium: Subsurface Soil

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name
				SA	Skin Surface Area Available for Contact	5,700	cm^2	EPA, 2001	CS x SA x SSAF x DABS x CF1 x EF x
				SSAF	Soil to Skin Adherence Factor	0.07	mg/cm^2-day	EPA, 2001	ED x 1/BW x 1/AT
				DABS	Dermal Absorption Factor Solids	Chemical Specific	--	EPA, 2001	
				CF	Conversion Factor	0.000001	kg/mg	- -	
				EF	Exposure Frequency	350	days/year	EPA, 1991	
				ED	Exposure Duration	24	years	EPA, 1991	
				BW	Body Weight	70	kg	EPA, 1991	
				AT-N	Averaging Time (Non-Cancer)	8,760	days	EPA, 1989	
				AT-C	Averaging Time (Cancer)	25,550	days	EPA, 1989	
		Child	SWMU 6 Subsurface Soil	CS	Chemical Concentration in Soil	See Table 3.2.RME	mg/kg	See Table 3.2.RME	CDI (mg/kg-day) =
				SA	Skin Surface Area Available for Contact	2,800	cm^2	EPA, 2001	CS x SA x SSAF x DABS x CF1 x EF x
				SSAF	Soil to Skin Adherence Factor	0.2	mg/cm^2-day	EPA, 2001	ED x 1/BW x 1/AT
				DABS	Dermal Absorption Factor Solids	Chemical Specific	--	EPA, 2001	
				CF	Conversion Factor	0.000001	kg/mg	- -	
				EF	Exposure Frequency	350	days/year	EPA, 1991	
				ED	Exposure Duration	6	years	EPA, 1991	
				BW	Body Weight	15	kg	EPA, 1991	
				AT-C	Averaging Time (Cancer)	25,550	days	EPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	2,190	days	EPA, 1989	
Dermal	Construction Worker	Adult	SWMU 6 Subsurface Soil	CS	Chemical Concentration in Soil	See Table 3.2.RME	mg/kg	See Table 3.2.RME	CDI (mg/kg-day) =
				SA	Skin Surface Area Available for Contact	3,300	cm^2	EPA, 2001, (2)	CS x SA x SSAF x DABS x CF1 x EF x
				SSAF	Soil to Skin Adherence Factor	0.3	mg/cm^2-day	EPA, 2002	ED x 1/BW x 1/AT
				DABS	Dermal Absorption Factor Solids	Chemical Specific	--	EPA, 2001	
				CF1	Conversion Factor 1	0.000001	kg/mg	- -	
				EF	Exposure Frequency	250	days/year	EPA, 1989	
				ED	Exposure Duration	0.5	years	(1)	
				BW	Body Weight	70	kg	EPA, 1991	
				AT-N	Averaging Time (Non-Cancer)	183	days	EPA, 1989	

TABLE 4.7.RME

VALUES USED FOR DAILY INTAKE CALCULATIONS

REASONABLE MAXIMUM EXPOSURE

SWMU 6 - Mangrove Disposal Site

NASD, Vieques Island, Puerto Rico

Scenario Timeframe: Future
Medium: Subsurface Soil
Exposure Medium: Subsurface Soil

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name
				AT-C	Averaging Time (Cancer)	25,550	days	EPA, 1989	

Notes:

(1) Recommended by EPA Region II.

(2) Worker assumed to wear a short-sleeved shirt, long pants, and shoes therefore, the exposed surface area is face, hands and forearms.

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 2001: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Interim. EPA/540/R/99/005.

EPA, 2002: Supplemental Guidance for Developing Soil Screening Levels for Superfund Sites, OSWER 9355.4-24, December, 2002.

TABLE 4.8.RME
VALUES USED FOR DAILY INTAKE CALCULATIONS
REASONABLE MAXIMUM EXPOSURE
SWMU 6 - Mangrove Disposal Site
NASD, Vieques Island, Puerto Rico

Scenario Timeframe: Future
Medium: Subsurface Soil
Exposure Medium: Air

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name
Inhalation	Residential	Adult	Emissions from SWMU 6 Subsurface Soil	CS	Chemical Concentration in Soil	See Table 3.2.RME	mg/kg	See Table 3.2.RME	Chronic Daily Intake (CDI) (mg/kg-day) =
				CA	Chemical Concentration in Air	Calculated	mg/m^3	EPA, 2002	CA x IN x EF x ED x 1/BW x 1/AT
				PEF	Particulate Emission Factor	1.36E+09	m^3/kg	EPA, 2002	
				VF	Volatilization Factor for volatile constituents	Calculated	m^3/kg	EPA, 2002	CA (mg/m^3) = CS (1/PEF + 1/VF)
				IN	Inhalation Rate	20	m^3/day	EPA, 1991	
				EF	Exposure Frequency	350	days/year	EPA, 1991	
				ED	Exposure Duration	24	years	EPA, 1991	
				BW	Body Weight	70	kg	EPA, 1991	
				AT-N	Averaging Time (Non-Cancer)	8,760	days	EPA, 1989	
				AT-C	Averaging Time (Cancer)	25,550	days	EPA, 1989	
		Child	Emissions from SWMU 6 Subsurface Soil	CS	Chemical Concentration in Soil	See Table 3.2.RME	mg/kg	See Table 3.2.RME	CDI (mg/kg-day) =
				CA	Chemical Concentration in Air	Calculated	mg/m^3	EPA, 2002	CA x IN x EF x ED x 1/BW x 1/AT
				PEF	Particulate Emission Factor	1.36E+09	m^3/kg	EPA, 2002	
				VF	Volatilization Factor for volatile constituents	Calculated	m^3/kg	EPA, 2002	CA (mg/m^3) = CS (1/PEF + 1/VF)
				IN	Inhalation Rate	15	m^3/day	EPA, 1991	
				EF	Exposure Frequency	350	days/year	EPA, 1991	
				ED	Exposure Duration	6	years	EPA, 1991	
				CF3	Conversion Factor 3	0.000001	kg/mg	- -	
				BW	Body Weight	15	kg	EPA, 1991	
				AT-N	Averaging Time (Non-Cancer)	2,190	days	EPA, 1989	
				AT-C	Averaging Time (Cancer)	25,550	days	EPA, 1989	
Inhalation	Construction Worker	Adult	Emissions from SWMU 6 Subsurface Soil	CS	Chemical Concentration in Soil	See Table 3.2.RME	mg/kg	See Table 3.2.RME	Chronic Daily Intake (CDI) (mg/kg-day) =
				CA	Chemical Concentration in Air	Calculated	mg/m^3	EPA, 2002	CA x IN x EF x ED x 1/BW x 1/AT
				PEF	Particulate Emission Factor	1.36E+09	m^3/kg	EPA, 2002	
				VF	Volatilization Factor for volatile constituents	Calculated	m^3/kg	EPA, 2002	CA (mg/m^3) = CS (1/PEF + 1/VF)
				IN	Inhalation Rate	20	m^3/day	EPA, 1991	

TABLE 4.8.RME

VALUES USED FOR DAILY INTAKE CALCULATIONS

REASONABLE MAXIMUM EXPOSURE

SWMU 6 - Mangrove Disposal Site

NASD, Vieques Island, Puerto Rico

Scenario Timeframe: Future
Medium: Subsurface Soil
Exposure Medium: Air

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name
				EF	Exposure Frequency	250	days/year	EPA, 1989	
				ED	Exposure Duration	0.5	years	(1)	
				BW	Body Weight	70	kg	EPA, 1991	
				AT-N	Averaging Time (Non-Cancer)	183	days	EPA, 1989	
				AT-C	Averaging Time (Cancer)	25,550	days	EPA, 1989	

Notes:

(1) Recommended by EPA Region II.

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 2002: Supplemental Guidance for Developing Soil Screening Levels for Superfund Sites, OSWER 9355.4-24, December, 2002.

TABLE 4.9.RME
VALUES USED FOR DAILY INTAKE CALCULATIONS
REASONABLE MAXIMUM EXPOSURE
SWMU 6 - Mangrove Disposal Site
NASD, Vieques Island, Puerto Rico

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Residential	Adult	Tap Water	CW	Chemical Concentration in Water	See Table 3.3.RME	mg/L	See Table 3.3.RME	Chronic Daily Intake (CDI) (mg/kg-day) =
				IR-W	Ingestion Rate of Water	2	liters/day	EPA, 1991	CW x IR-W x EF x ED x 1/BW x 1/AT
				EF	Exposure Frequency	350	days/year	EPA, 1991	
				ED	Exposure Duration	24	years	EPA, 1991	
				BW	Body Weight	70	kg	EPA, 1991	
				AT-N	Averaging Time (Non-Cancer)	8,760	days	EPA, 1989	
				AT-C	Averaging Time (Cancer)	25,550	days	EPA, 1989	
		Child	Tap Water	CW	Chemical Concentration in Water	See Table 3.3.RME	mg/L	See Table 3.3.RME	CDI (mg/kg-day) =
				IR-W	Ingestion Rate of Water	1	liters/day	EPA, 1991	CW x IR-W x EF x ED x 1/BW x 1/AT
				EF	Exposure Frequency	350	days/year	EPA, 1991	
				ED	Exposure Duration	6	years	EPA, 1991	
				BW	Body Weight	15	kg	EPA, 1991	
				AT-N	Averaging Time (Non-Cancer)	2,190	days	EPA, 1989	
				AT-C	Averaging Time (Cancer)	25,550	days	EPA, 1989	
	Industrial Worker	Adult	Tap Water	CW	Chemical Concentration in Water	See Table 3.3.RME	mg/L	See Table 3.3.RME	CDI (mg/kg-day) =
				IR-W	Ingestion Rate of Water	1	liters/day	EPA, 1991	CW x IR-W x EF x ED x 1/BW x 1/AT
				EF	Exposure Frequency	250	days/year	EPA, 1991	
				ED	Exposure Duration	25	years	EPA, 1991	
				BW	Body Weight	70	kg	EPA, 1991	
				AT-C	Averaging Time (Cancer)	25,550	days	EPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	9,125	days	EPA, 1989	

TABLE 4.9.RME
VALUES USED FOR DAILY INTAKE CALCULATIONS
REASONABLE MAXIMUM EXPOSURE
SWMU 6 - Mangrove Disposal Site
NASD, Vieques Island, Puerto Rico

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name
Dermal	Resident	Adult	Tap Water	CW	Chemical Concentration in Water	See Table 3.3.RME	mg/L	See Table 3.3.RME	CDI (mg/kg-day) =
				DAevent	Dermally Absorbed Dose per Event	Calculated	mg/cm^2-event	calculated	DAevent x SA x EV x EF x ED x 1/BW x 1/AT
				FA	Fraction absorbed water	Chemical Specific	dimensionless	EPA, 2001	
				Kp	Permeability Coefficient	Chemical Specific	cm/hr	EPA, 2001	Inorganics: DAevent (mg/cm^2-event) =
				τ	Lag Time	Chemical Specific	hr/event	EPA, 2001	Kp x CW x t_{event} x CF
				t*	Time to Reach Steady-state	Chemical Specific	hours	EPA, 2001	
				B	Ratio of Permeability of Stratum Corneum to Epidermis	Chemical Specific	dimensionless	EPA, 2001	Organics :
				t_{event}	Event Time	0.58	hr/event	EPA, 2001	t_{event}<t*: DAevent (mg/cm^2-event) =
				SA	Skin Surface Area Available for Contact	18,000	cm^2	EPA, 2001	2 x FA x Kp x CW x (sqrt((6 x τ x t_{event})/π)) x CF
				EV	Event Frequency	1	events/day	EPA, 2001	
				EF	Exposure Frequency	350	days/year	EPA, 2001	
				ED	Exposure Duration	24	years	EPA, 2001	t_{event}>t*: DAevent (mg/cm^2-event) =
				BW	Body Weight	70	kg	EPA, 1991	FA x Kp x CW x (t_{event}/(1+B) + 2 x τ x
				AT-C	Averaging Time (Cancer)	25,550	days	EPA, 1989	((1 + 3B + $3B^2$)/$(1+B)^3$)) x CF
				AT-N	Averaging Time (Non-Cancer)	8,760	days	EPA, 1989	
				CF1	Conversion Factor 1	0.001	l/cm^3	- -	
				CF2	Conversion Factor 2	0.001	mg/ug	- -	
		Child	Tap Water	CW	Chemical Concentration in Water	See Table 3.3.RME	mg/L	See Table 3.3.RME	CDI (mg/kg-day) =
				DAevent	Dermally Absorbed Dose per Event	Calculated	mg/cm^2-event	calculated	DAevent x SA x EV x EF x ED x 1/BW x 1/AT
				FA	Fraction absorbed water	Chemical Specific	dimensionless	EPA, 2001	
				Kp	Permeability Coefficient	Chemical Specific	cm/hr	EPA, 2001	Inorganics: DAevent (mg/cm^2-event) =
				τ	Lag Time	Chemical Specific	hr/event	EPA, 2001	Kp x CW x t_{event} x CF
				t*	Time to Reach Steady-state	Chemical Specific	hours	EPA, 2001	
		Child	Tap Water	B	Ratio of Permeability of Stratum Corneum to Epidermis	Chemical Specific	dimensionless	EPA, 2001	Organics :
				t_{event}	Event Time	1	hr/event		t_{event}<t*: DAevent (mg/cm^2-event) =
				SA	Skin Surface Area Available for Contact	6,600	cm^2	EPA, 2001	2 x FA x Kp x CW x (sqrt((6 x τ x t_{event})/π)) x CF
				EV	Event Frequency	1	events/day	EPA, 2001	
				EF	Exposure Frequency	350	days/year	EPA, 2001	
				ED	Exposure Duration	6	years	EPA, 2001	t_{event}>t*: DAevent (mg/cm^2-event) =
				BW	Body Weight	15	kg	EPA, 1991	FA x Kp x CW x (t_{event}/(1+B) + 2 x τ x
				AT-C	Averaging Time (Cancer)	25,550	days	EPA, 1989	((1 + 3B + $3B^2$)/$(1+B)^2$)) x CF
				AT-N	Averaging Time (Non-Cancer)	2190	days	EPA, 1989	
				CF1	Conversion Factor 1	0.001	l/cm^3	- -	
				CF2	Conversion Factor 2	0.001	mg/ug	- -	

TABLE 4.9.RME
VALUES USED FOR DAILY INTAKE CALCULATIONS
REASONABLE MAXIMUM EXPOSURE
SWMU 6 - Mangrove Disposal Site
NASD, Vieques Island, Puerto Rico

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name
	Industrial Worker	Adult	Tap Water	CW	Chemical Concentration in Water	See Table 3.3.RME	mg/L	See Table 3.3.RME	CDI (mg/kg-day) =
				DAevent	Dermally Absorbed Dose per Event	Calculated	mg/cm^2-event	calculated	DAevent x SA x EV x EF x ED x 1/BW x 1/AT
				FA	Fraction absorbed water	Chemical Specific	dimensionless	EPA, 2001	
				Kp	Permeability Coefficient	Chemical Specific	cm/hr	EPA, 2001	Inorganics: DAevent (mg/cm^2-event) =
				τ	Lag Time	Chemical Specific	hr/event	EPA, 2001	Kp x CW x t_{event} x CF
				t*	Time to Reach Steady-state	Chemical Specific	hours	EPA, 2001	
				B	Ratio of Permeability of Stratum Corneum to Epidermis	Chemical Specific	dimensionless	EPA, 2001	Organics :
				t_{event}	Event Time	0.05	hr/day	(1)	t_{event}<t*: DAevent (mg/cm^2-event) =
				SA	Skin Surface Area Available for Contact	3,300	cm^2	EPA, 2001, (2)	2 x FA x Kp x CW x (sqrt((6 x τ x t_{event})/π)) x CF
				EV	Event Frequency	5	events/day	(1)	
				EF	Exposure Frequency	250	days/year	EPA, 1991	
				ED	Exposure Duration	25	years	EPA, 1991	t_{event}>t*: DAevent (mg/cm^2-event) =
				BW	Body Weight	70	kg	EPA, 1991	FA x Kp x CW x (t_{event}/(1+B) + 2 x τ x
				AT-C	Averaging Time (Cancer)	25,550	days	EPA, 1989	((1 + 3B + $3B^2$)/$(1+B)^2$)) x CF
				AT-N	Averaging Time (Non-Cancer)	9,125	days	EPA, 1989	
				CF1	Conversion Factor 1	0.001	l/cm^3	- -	
				CF2	Conversion Factor 2	0.001	mg/ug	- -	

(1) Professional judgement, assumed to be equivalent to dermal event duration for residential adult as recommended by EPA Region II (five 3-minute events).

(2) Worker assumed to wear a short-sleeved shirt, long pants, and shoes therefore, the exposed surface area is face, hands and forearms.

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 2001: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Interim. EPA/540/R/99/005.

TABLE 4.10.RME

VALUES USED FOR DAILY INTAKE CALCULATIONS

REASONABLE MAXIMUM EXPOSURE

SWMU 6 - Mangrove Disposal Site

NASD, Vieques Island, Puerto Rico

Scenario Timeframe: Future
Medium: Sediment
Exposure Medium: Sediment

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Residential	Adult	Kiani Lagoon	Csed	Chemical Concentration in Sediment	See Table 3.4.RME	mg/kg	See Table 3.4.RME	Chronic Daily Intake (CDI) (mg/kg-day) =
				IR-Sed	Ingestion Rate of Sediment	50	mg/day	(1)	CSed x IR-Sed x EF x ED x CF x 1/BW x 1/AT
				EF	Exposure Frequency	52	days/year	(2)	
				ED	Exposure Duration	24	years	EPA, 1991	
				CF	Conversion Factor	0.000001	kg/mg	- -	
				BW	Body Weight	70	kg	EPA, 1991	
				AT-N	Averaging Time (Non-Cancer)	8,760	days	EPA, 1989	
				AT-C	Averaging Time (Cancer)	25,550	days	EPA, 1989	
		Child	Kiani Lagoon	Csed	Chemical Concentration in Sediment	See Table 3.4.RME	mg/kg	See Table 3.4.RME	CDI (mg/kg-day) =
				IR-Sed	Ingestion Rate of Sediment	100	mg/day	(1)	CS x IR-S x EF x ED x CF x 1/BW x 1/AT
				EF	Exposure Frequency	52	days/year	(2)	
				ED	Exposure Duration	6	years	EPA, 1991	
				CF	Conversion Factor	0.000001	kg/mg	- -	
				BW	Body Weight	15	kg	EPA, 1991	
				AT-N	Averaging Time (Non-Cancer)	2,190	days	EPA, 1989	
				AT-C	Averaging Time (Cancer)	25,550	days	EPA, 1989	
Dermal	Residential	Adult	Kiani Lagoon	Csed	Chemical Concentration in Sediment	See Table 3.4.RME	mg/kg	See Table 3.4.RME	CDI (mg/kg-day) =
				SA	Skin Surface Area Available for Contact	5,170	cm^2	EPA, 1997, (3)	CSed x SA x SSAF x DABS x CF x EF x
				SSAF	Soil to Skin Adherence Factor	0.36	mg/cm^2-day	EPA, 1997, (4)	ED x 1/BW x 1/AT
				DABS	Dermal Absorption Factor Solids	Chemical Specific	--	EPA, 2001	
				CF	Conversion Factor	0.000001	kg/mg	- -	
				EF	Exposure Frequency	52	days/year	(1)	
				ED	Exposure Duration	24	years	(2)	
				BW	Body Weight	70	kg	EPA, 1991	
				AT-N	Averaging Time (Non-Cancer)	8,760	days	EPA, 1989	
				AT-C	Averaging Time (Cancer)	25,550	days	EPA, 1989	

TABLE 4.10.RME

VALUES USED FOR DAILY INTAKE CALCULATIONS

REASONABLE MAXIMUM EXPOSURE

SWMU 6 - Mangrove Disposal Site

NASD, Vieques Island, Puerto Rico

Scenario Timeframe: Future
Medium: Sediment
Exposure Medium: Sediment

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name
		Child	Kiani Lagoon	Csed	Chemical Concentration in Sediment	See Table 3.4.RME	mg/kg	See Table 3.4.RME	CDI (mg/kg-day) =
				SA	Skin Surface Area Available for Contact	2,000	cm^2	EPA, 1997, (5)	CSed x SA x SSAF x DABS x CF x EF x
				SSAF	Soil to Skin Adherence Factor	36	mg/cm^2-day	EPA, 1997, (6)	ED x 1/BW x 1/AT
				DABS	Dermal Absorption Factor Solids	Chemical Specific	--	EPA, 2001	
				CF	Conversion Factor	0.000001	kg/mg	- -	
				EF	Exposure Frequency	52	days/year	(1)	
				ED	Exposure Duration	6	years	EPA, 1991	
				BW	Body Weight	15	kg	EPA, 1991	
				AT-N	Averaging Time (Non-Cancer)	2,190	days	EPA, 1989	
				AT-C	Averaging Time (Cancer)	25,550	days	EPA, 1989	

Notes:

(1) Professional judgement assuming 1/2 the default value for the residential soil scenario.

(2) Professional judgement assuming 1 day per week for 52 weeks per year.

(3) SA is the sum of the mean surface areas (for a male) of the hands, forearms, feet, and lower legs.

(4) SSAF is soil adherence to legs for Rugby No. 1 from EPA, 1997, Table 6-12.

(5) Surface area is 25% of total surface area (95 percentile) for 0 to 6 year old children.

(6) SSAF is soil adherence to legs for Kids No. 1 from EPA, 1997, Table 6-12.

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1997: Exposure Factors Handbook. EPA/600/P-95/002Fa.

EPA, 2001: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Interim. EPA/540/R/99/005.

TABLE 4.11.RME

VALUES USED FOR DAILY INTAKE CALCULATIONS

REASONABLE MAXIMUM EXPOSURE

SWMU 6 - Mangrove Disposal Site

NASD, Vieques Island, Puerto Rico

Scenario Timeframe: Future
Medium: Surface Water
Exposure Medium: Surface Water

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Residential	Adult	Kiani Lagoon	CSW	Chemical Concentration in Surface Water	See Table 3.5.RME	µg/l	See Table 3.5.RME	Chronic Daily Intake (CDI) (mg/kg-day) =
				IR-SW	Ingestion Rate of Surface Water	0.025	l/hour	EPA, 1989, (1)	CSW x IR-SW x ET x EF x ED x CF1 x
				ET	Exposure Time	2.6	hr/day	EPA, 1989	1/BW x 1/AT
				EF	Exposure Frequency	52	days/year	(2)	
				ED	Exposure Duration	24	years	EPA, 1991	
				CF1	Conversion Factor 1	0.001	mg/µg	- -	
				BW	Body Weight	70	kg	EPA, 1991	
				AT-N	Averaging Time (Non-Cancer)	8,760	days	EPA, 1989	
				AT-C	Averaging Time (Cancer)	25,550	days	EPA, 1989	
		Child	Kiani Lagoon	CSW	Chemical Concentration in Surface Water	See Table 3.5.RME	µg/l	See Table 3.5.RME	CDI (mg/kg-day) =
				IR-SW	Ingestion Rate of Surface Water	0.025	l/hour	EPA, 1989, (1)	CSW x IR-SW x ET x EF x ED x CF1 x
				ET	Exposure Time	2.6	hr/day	EPA, 1989	1/BW x 1/AT
				EF	Exposure Frequency	52	days/year	(2)	
				ED	Exposure Duration	6	years	EPA, 1991	
				CF1	Conversion Factor 1	0.001	mg/µg	- -	
				BW	Body Weight	15	kg	EPA, 1991	
				AT-N	Averaging Time (Non-Cancer)	2,190	EPA, 1989	EPA, 1989	
				AT-C	Averaging Time (Cancer)	25,550	EPA, 1989	EPA, 1989	

TABLE 4.11.RME

VALUES USED FOR DAILY INTAKE CALCULATIONS

REASONABLE MAXIMUM EXPOSURE

SWMU 6 - Mangrove Disposal Site

NASD, Vieques Island, Puerto Rico

Scenario Timeframe: Future
Medium: Surface Water
Exposure Medium: Surface Water

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name
Dermal	Residential	Adult	Kiani Lagoon	CSW	Chemical Concentration in Surface Water	See Table 3.5.RME	µg/l	See Table 3.5.RME	CDI (mg/kg-day) =
				DAevent	Dermally Absorbed Dose per Event	calculated	mg/cm^2-event	calculated	DAevent x SA x EV x EF x ED x 1/BW x 1/AT
				FA	Fraction absorbed water	Chemical Specific	dimensionless	EPA, 2001	
				Kp	Permeability Coefficient	Chemical Specific	cm/hr	EPA, 2001	Inorganics: DAevent (mg/cm^2-event) =
				τ	Lag Time	Chemical Specific	hr/event	EPA, 2001	Kp x CW x t_{event} x CF1 x CF2
				t*	Time to Reach Steady-state	Chemical Specific	hours	EPA, 2001	
				B	Ratio of Permeability of Stratum Corneum to Epidermis	Chemical Specific	dimensionless	EPA, 2001	Organics :
				t_{event}	Event Time	2.6	hr/event	EPA, 1989	t_{event}<t*: DAevent (mg/cm^2-event) =
				SA	Skin Surface Area Available for Contact	5,170	cm^2	EPA, 1997, (3)	2 x FA x Kp x CW x (sqrt((6 x τ x t_{event})/ π))
				EV	Event Frequency	1	events/day	EPA, 2001	x CF1 x CF2
				EF	Exposure Frequency	52	days/year	(2)	
				ED	Exposure Duration	24	years	EPA, 1991	t_{event}>t*: DAevent (mg/cm^2-event) =
				BW	Body Weight	70	kg	EPA, 1991	FA x Kp x CW x (t_{event}/(1+B) + 2 x τ x
				AT-N	Averaging Time (Non-Cancer)	8,760	days	EPA, 1989	((1 + 3B + $3B^2$)/$(1+B)^2$)) x CF1 x CF2
				AT-C	Averaging Time (Cancer)	25,550	days	EPA, 1989	
				CF1	Conversion Factor 1	0.001	mg/µg	- -	
				CF2	Conversion Factor 2	0.001	l/cm^3	- -	

TABLE 4.11.RME

VALUES USED FOR DAILY INTAKE CALCULATIONS

REASONABLE MAXIMUM EXPOSURE

SWMU 6 - Mangrove Disposal Site

NASD, Vieques Island, Puerto Rico

Scenario Timeframe: Future
Medium: Surface Water
Exposure Medium: Surface Water

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name
Dermal	Residential	Child	Kiani Lagoon	CSW	Chemical Concentration in Surface Water	See Table 3.5.RME	µg/l	See Table 3.5.RME	CDI (mg/kg-day) =
				DAevent	Dermally Absorbed Dose per Event	calculated	mg/cm^2-event	calculated	DAevent x SA x EV x EF x ED x 1/BW x 1/AT
				FA	Fraction absorbed water	Chemical Specific	dimensionless	EPA, 2001	
				Kp	Permeability Coefficient	Chemical Specific	cm/hr	EPA, 2001	Inorganics: DAevent (mg/cm^2-event) =
				τ	Lag Time	Chemical Specific	hr/event	EPA, 2001	Kp x CW x t_{event} x CF1 x CF2
				t*	Time to Reach Steady-state	Chemical Specific	hours	EPA, 2001	
				B	Ratio of Permeability of Stratum Corneum to Epidermis	Chemical Specific	dimensionless	EPA, 2001	Organics :
				t_{event}	Event Time	2.6	hr/event	EPA, 1989	t_{event}<t*: DAevent (mg/cm^2-event) =
				SA	Skin Surface Area Available for Contact	2,000	cm^2	EPA, 1997, (4)	2 x FA x Kp x CW x (sqrt((6 x τ x t_{event})/ π))
				EV	Event Frequency	1	events/day	EPA, 2001	x CF1 x CF2
				EF	Exposure Frequency	52	days/year	(2)	
				ED	Exposure Duration	6	years	EPA, 1991	t_{event}>t*: DAevent (mg/cm^2-event) =
				BW	Body Weight	15	kg	EPA, 1991	FA x Kp x CW x (t_{event}/(1+B) + 2 x τ x
				AT-N	Averaging Time (Non-Cancer)	2,190	EPA, 1989	EPA, 1989	((1 + 3B + $3B^2$)/$(1+B)^3$)) x CF1 x CF2
				AT-C	Averaging Time (Cancer)	25,550	EPA, 1989	EPA, 1989	
				CF1	Conversion Factor 1	0.001	mg/µg	- -	
				CF2	Conversion Factor 2	0.001	l/cm^3	- -	

Notes:

(1) Professional Judgment assuming one half of the ingestion rate specified for swimming.

(2) Professional Judgement assuming 1 day per week for 52 weeks per year.

(3) SA is the sum of the mean surface areas (for a male) of the hands, forearms, feet, and lower legs.

(4) Surface area is 25% of total surface area (95 percentile) for 0 to 6 year old children.

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1997: Exposure Factors Handbook. EPA/600/P-95/002Fa.

EPA, 2001: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Interim. EPA/540/R/99/005.

TABLE 5.1

NON-CANCER TOXICITY DATA -- ORAL/DERMAL

SWMU 6 - Mangrove Disposal Site

NASD, Vieques Island, Puerto Rico

Chemical of Potential Concern	Chronic/ Subchronic	Oral RfD		Oral Absorption Efficiency for Dermal (1)	Absorbed RfD for Dermal (2)		Primary Target Organ(s)	Combined Uncertainty/Modifying Factors	RfD:Target Organ(s)	
		Value	Units		Value	Units			Source(s)	Date(s) (MM/DD/YYYY)
Aluminum	Chronic	1.0E+00	mg/kg-day	NA	1.0E+00	mg/kg-day	CNS	100/3	NCEA	07/26/2001
	Subchronic	NA	NA	NA	NA	NA	NA	NA	NA	NA
Antimony	Chronic	4.0E-04	mg/kg-day	0.15	6.0E-05	mg/kg-day	Blood	1000	IRIS	11/07/2003
	Subchronic	4.0E-04	mg/kg-day	0.15	6.0E-05	mg/kg-day	Blood	1000	HEAST	07/01/1997
Arsenic	Chronic	3.0E-04	mg/kg-day	0.95	3.0E-04	mg/kg-day	Skin, Vascular	3/1	IRIS	11/07/2003
	Subchronic	3.0E-04	mg/kg-day	0.95	3.0E-04	mg/kg-day	Skin, Vascular	3	HEAST	07/01/1997
Barium	Chronic	7.0E-02	mg/kg-day	0.07	4.9E-03	mg/kg-day	NOAEL	3/1	IRIS	01/07/2004
	Subchronic	7.0E-02	mg/kg-day	0.07	4.9E-03	mg/kg-day	Cardiovascular	3	HEAST	07/01/1997
Benzo(a)anthracene	Chronic	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Subchronic	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(a)pyrene	Chronic	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Subchronic	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(b)fluoranthene	Chronic	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Subchronic	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cadmium (Food)	Chronic	1.0E-03	mg/kg-day	0.025	2.5E-05	mg/kg-day	Kidney	10	IRIS	11/07/2003
	Subchronic	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cadmium (Water)	Chronic	5.0E-04	mg/kg-day	0.025	1.3E-05	mg/kg-day	Kidney	10	IRIS	11/07/2003
	Subchronic	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chloroform	Chronic	1.0E-02	mg/kg-day	1	1.0E-02	mg/kg-day	Liver, Blood	1000/1	IRIS	01/02/2004
	Subchronic	1.0E-02	mg/kg-day	1	1.0E-02	mg/kg-day	Liver, Blood	1000	HEAST	07/01/1997
Chromium (hexavalent)	Chronic	3.0E-03	mg/kg-day	0.025	7.5E-05	mg/kg-day	NOAEL	300/3	IRIS	11/07/2003
	Subchronic	2.0E-02	mg/kg-day	0.025	5.0E-04	mg/kg-day	NOAEL	100	HEAST	07/01/1997
Dibenz(a,h)anthracene	Chronic	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Subchronic	NA	NA	NA	NA	NA	NA	NA	NA	NA
Indeno(1,2,3-cd)pyrene	Chronic	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Subchronic	NA	NA	NA	NA	NA	NA	NA	NA	NA

TABLE 5.1

NON-CANCER TOXICITY DATA -- ORAL/DERMAL

SWMU 6 - Mangrove Disposal Site

NASD, Vieques Island, Puerto Rico

Chemical of Potential Concern	Chronic/ Subchronic	Oral RfD		Oral Absorption Efficiency for Dermal (1)	Absorbed RfD for Dermal (2)		Primary Target Organ(s)	Combined Uncertainty/Modifying Factors	RfD:Target Organ(s)	
		Value	Units		Value	Units			Source(s)	Date(s) (MM/DD/YYYY)
Iron	Chronic	3.0E-01	mg/kg-day	1	3.0E-01	mg/kg-day	Blood, Gastrointestinal, Liver	1	NCEA	06/21/2001
	Subchronic	NA	NA	NA	NA	NA	NA	NA	NA	NA
Lead	Chronic	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Subchronic	NA	NA	NA	NA	NA	NA	NA	NA	NA
Manganese (nonfood)	Chronic	2.0E-02	mg/kg-day	0.04	8.0E-04	mg/kg-day	CNS	1	IRIS	11/07/2003
	Subchronic	NA	NA	NA	NA	NA	NA	NA	NA	NA
Manganese (food)	Chronic	1.4E-01	mg/kg-day	0.04	5.6E-03	mg/kg-day	CNS	1/1	IRIS	11/07/2003
	Subchronic	NA	NA	NA	NA	NA	NA	NA	NA	NA
Mercury (Inorganic)	Chronic	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Subchronic	NA	NA	NA	NA	NA	NA	NA	NA	NA
Mercuric chloride	Chronic	3.0E-04	mg/kg-day	0.07	2.1E-05	mg/kg-day	Immune System	1000/1	IRIS	11/07/2003
	Subchronic	3.0E-03	mg/kg-day	0.07	2.1E-04	mg/kg-day	Immune System	100	HEAST	07/01/1997
Nickel	Chronic	2.0E-02	mg/kg-day	0.04	8.0E-04	mg/kg-day	Whole Body	300/1	IRIS	11/07/2003
	Subchronic	2.0E-02	mg/kg-day	0.04	8.0E-04	mg/kg-day	Whole Body	300	HEAST	07/01/1997
PCB-1221 (Aroclor 1221)	Chronic	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Subchronic	NA	NA	NA	NA	NA	NA	NA	NA	NA
PCB-1232 (Aroclor 1232)	Chronic	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Subchronic	NA	NA	NA	NA	NA	NA	NA	NA	NA
Perchlorate	Chronic	3.0E-05	mg/kg-day	NA	3.0E-05	mg/kg-day	Thyroid	300/1	NCEA	01/16/2002
	Subchronic	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Selenium	Chronic	5.0E-03	mg/kg-day	0.3 - 0.8	5.0E-03	mg/kg-day	Whole Body	3/1	IRIS	01/05/2004
	Subchronic	5.0E-03	mg/kg-day	0.3 - 0.8	5.0E-03	mg/kg-day	Whole Body	3	HEAST	07/01/1997
Silver	Chronic	5.0E-03	mg/kg-day	0.04	2.0E-04	mg/kg-day	Skin	3/1	IRIS	01/05/2004
	Subchronic	5.0E-03	mg/kg-day	0.04	2.0E-04	mg/kg-day	Skin	3	HEAST	07/01/1997
Thallium	Chronic	8.0E-05	mg/kg-day	1	8.0E-05	mg/kg-day	Liver, Blood, Hair	3000/1	IRIS	01/05/2004
	Subchronic	8.0E-04	mg/kg-day	1	8.0E-04	mg/kg-day	Liver, Blood, Hair	300	HEAST	07/01/1997

TABLE 5.1

NON-CANCER TOXICITY DATA -- ORAL/DERMAL

SWMU 6 - Mangrove Disposal Site

NASD, Vieques Island, Puerto Rico

Chemical of Potential Concern	Chronic/ Subchronic	Oral RfD		Oral Absorption Efficiency for Dermal (1)	Absorbed RfD for Dermal (2)		Primary Target Organ(s)	Combined Uncertainty/Modifying Factors	RfD:Target Organ(s)	
		Value	Units		Value	Units			Source(s)	Date(s) (MM/DD/YYYY)
Vanadium	Chronic	1.0E-03	mg/kg-day	0.026	2.6E-05	mg/kg-day	Kidney	100	NCEA	05/01/2000
	Subchronic	7.0E-03	mg/kg-day	0.026	1.8E-04	mg/kg-day	Lifetime	100	HEAST	07/01/1997

(1) Source: Risk Assessment Guidance for Superfund. Volume 1: Human Health Evalution Manual (Part E, Supplemetnal Guidance for Dermal Risk Assessment (Interim). Section 4.2 and Exhibit 4-1. USEPA recommends that the oral RfD should not be adjusted to estimate the absorbed dose for compounds when the absorption efficiency is greater than 50%. Constituents that do not have oral absorption efficiencies reported on this table were assumed to have an oral absorption efficiency of 100%.

(2) See Risk Assessment text for the derivation of the "Absorbed RfD for Dermal"

Definitions: NA = Not Available

IRIS = Integrated Risk Information System

HEAST = Health Effects Assessment Summary Tables

NCEA = National Center for Environmental Assessment

CNS = Central Nervous System

NOAEL = No Observed Adverse Effects Level

TABLE 5-2

NON-CANCER TOXICITY DATA -- INHALATION

SWMU 6 - Mangrove Disposal Site

NASD, Vieques Island, Puerto Rico

Chemical of Potential Concern	Chronic/ Subchronic	Value Inhalation RfC	Units	Adjusted Inhalation RfD (1)	Units	Primary Target Organ	Combined Uncertainty/Modifying Factors	Sources of RfC:RfD: Target Organ	Dates (MM/DD/YY)
Aluminum	Chronic	5.0E-03	mg/m^3	1.4E-03	mg/kg-day	CNS	300	NCEA	07/26/2001
	Subchronic	NA	NA	NA	NA	NA	NA	NA	NA
Antimony	Chronic	NA	NA	NA	NA	NA	NA	NA	NA
	Subchronic	NA	NA	NA	NA	NA	NA	NA	NA
Arsenic	Chronic	NA	NA	NA	NA	NA	NA	NA	NA
	Subchronic	NA	NA	NA	NA	NA	NA	NA	NA
Barium	Chronic	5.00E-04	mg/m^3	1.40E-04	mg/kg-day	Fetotoxicity	1000	HEAST	07/01/1997
	Subchronic	5.00E-03	mg/m^3	1.40E-03	mg/kg-day	Fetotoxicity	100	HEAST	07/01/1997
Benzo(a)anthracene	Chronic	NA	NA	NA	NA	NA	NA	NA	NA
	Subchronic	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(a)pyrene	Chronic	NA	NA	NA	NA	NA	NA	NA	NA
	Subchronic	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(b)fluoranthene	Chronic	NA	NA	NA	NA	NA	NA	NA	NA
	Subchronic	NA	NA	NA	NA	NA	NA	NA	NA
Cadmium	Chronic	2.0E-04	mg/m^3	5.7E-05	mg/kg-day	Kidney	10	NCEA	06/14/1998
	Subchronic	NA	NA	NA	NA	NA	NA	NA	NA
Chloroform	Chronic	5.0E-02	mg/m^3	1.4E-02	mg/kg-day	Liver, Kidney, CNS	100/1	NCEA	01/22/2003
	Subchronic	5.0E-02	mg/m^3	1.4E-02	mg/kg-day	Liver, Kidney, CNS	100/1	NCEA	01/22/2003
Chromium (hexavalent)	Chronic	1.1E-04	mg/m^3	3.0E-05	mg/kg-day	Respiratory System	300/1	IRIS	11/07/2003
	Subchronic	NA	NA	NA	NA	NA	NA	NA	NA
Dibenz(a,h)anthracene	Chronic	NA	NA	NA	NA	NA	NA	NA	NA
	Subchronic	NA	NA	NA	NA	NA	NA	NA	NA
Indeno(1,2,3-cd)pyrene	Chronic	NA	NA	NA	NA	NA	NA	NA	NA
	Subchronic	NA	NA	NA	NA	NA	NA	NA	NA
Iron	Chronic	NA	NA	NA	NA	NA	NA	NA	NA
	Subchronic	NA	NA	NA	NA	NA	NA	NA	NA
Lead	Chronic	NA	NA	NA	NA	NA	NA	NA	NA
	Subchronic	NA	NA	NA	NA	NA	NA	NA	NA
Manganese	Chronic	5.0E-05	mg/m^3	1.4E-05	mg/kg-day	CNS	1000/1	IRIS	11/07/2003
	Subchronic	NA	NA	NA	NA	NA	NA	NA	NA
Mercury (Inorganic)	Chronic	3.0E-04	mg/m3	8.6E-05	mg/kg-day	CNS	30	IRIS	11/07/2003
	Subchronic	3.0E-04	mg/m3	8.6E-05	mg/kg-day	CNS	30	HEAST	07/01/1997
Mercuric chloride	Chronic	NA	NA	NA	NA	NA	NA	NA	NA
	Subchronic	NA	NA	NA	NA	NA	NA	NA	NA
Nickel	Chronic	N/A	NA	NA	NA	NA	NA	NA	NA
	Subchronic	N/A	NA	NA	NA	NA	NA	NA	NA

TABLE 5-2

NON-CANCER TOXICITY DATA -- INHALATION

SWMU 6 - Mangrove Disposal Site

NASD, Vieques Island, Puerto Rico

Chemical of Potential Concern	Chronic/ Subchronic	Value Inhalation RfC	Units	Adjusted Inhalation RfD (1)	Units	Primary Target Organ	Combined Uncertainty/Modifying Factors	Sources of RfC:RfD: Target Organ	Dates (MM/DD/YY)
PCB-1221 (Aroclor 1221)	Chronic	N/A	NA	NA	NA	NA	NA	NA	NA
	Subchronic	N/A	NA	NA	NA	NA	NA	NA	NA
PCB-1232 (Aroclor 1232)	Chronic	N/A	NA	NA	NA	NA	NA	NA	NA
	Subchronic	N/A	NA	NA	NA	NA	NA	NA	NA
Perchlorate	Chronic	N/A	NA	NA	NA	NA	NA	NA	NA
	Subchronic	N/A	NA	NA	NA	NA	NA	NA	NA
Selenium	Chronic	N/A	NA	NA	NA	NA	NA	NA	NA
	Subchronic	N/A	NA	NA	NA	NA	NA	NA	NA
Silver	Chronic	N/A	NA	NA	NA	NA	NA	NA	NA
	Subchronic	N/A	NA	NA	NA	NA	NA	NA	NA
Thallium	Chronic	N/A	NA	NA	NA	NA	NA	NA	NA
	Subchronic	N/A	NA	NA	NA	NA	NA	NA	NA
Vanadium	Chronic	NA	NA	NA	NA	NA	NA	NA	NA
	Subchronic	NA	NA	NA	NA	NA	NA	NA	NA

(1) See Risk Assessment text for the derivation of the "Extrapolated RfD".

Definitions:

NA = Not Available

IRIS = Integrated Risk Information System

NCEA = National Center for Environmental Assessment

CNS = Central Nervous System

ATSDR = Agency for Toxic Substances and Disease Registry

HEAST = Health Effects Assessment Summary Tables

TABLE 6.2

CANCER TOXICITY DATA -- INHALATION

SWMU 6 - Mangrove Disposal Site

NASD, Vieques Island, Puerto Rico

Chemical of Potential Concern	Unit Risk	Units	Adjustment (1)	Inhalation Cancer Slope Factor	Units	Weight of Evidence/ Cancer Guidance Description	Source	Date (2) (MM/DD/YY)
Aluminum	NA	NA	NA	NA	NA	D	NCEA	07/26/2001
Antimony	NA	NA	NA	NA	NA	NA	IRIS	11/07/2003
Arsenic	4.0E-03	$(ug/m^3)^{-1}$	3500	1.5E+01	$(mg/kg\text{-}day)^{-1}$	A	IRIS	11/07/2003
Barium	NA	NA	NA	NA	NA	D	IRIS	11/07/2003
Benzo(a)anthracene	NA	NA	NA	NA	NA	B2	NCEA	07/01/1993
Benzo(a)pyrene	8.9E-04	$(ug/m^3)^{-1}$	3500	3.1E+00	$(mg/kg\text{-}day)^{-1}$	B2	NCEA	07/01/1993
Benzo(b)fluoranthene	NA	NA	NA	NA	NA	B2	NCEA	07/01/1993
Cadmium	1.8E-03	$(ug/m^3)^{-1}$	3500	6.3E+00	$(mg/kg\text{-}day)^{-1}$	B1	IRIS	11/07/2003
Chloroform	2.3E-05	$(ug/m^3)^{-1}$	3500	8.1E-02	$(mg/kg\text{-}day)^{-1}$	B2	IRIS	01/05/2004
Chromium (hexavalent)	1.2E-02	$(ug/m^3)^{-1}$	3500	4.2E+01	$(mg/kg\text{-}day)^{-1}$	A	IRIS	01/05/2004
Dibenz(a,h)anthracene	NA	NA	NA	NA	NA	B2	NCEA	07/01/1993
Indeno(1,2,3-cd)pyrene	NA	NA	NA	NA	NA	B2	NCEA	07/01/1993
Iron	NA	NA	NA	NA	NA	C	NCEA	11/14/2001
Lead	NA	NA	NA	NA	NA	B2	IRIS	11/07/2003
Manganese	NA	NA	NA	NA	NA	D	IRIS	11/07/2003
Mercury (Inorganic)	N/A	NA	NA	NA	NA	D	IRIS	01/12/2004
Mercuric chloride	N/A	NA	NA	NA	NA	C	IRIS	11/07/2003
PCB-1221 (Aroclor 1221)	1.0E-04	$(ug/m^3)^{-1}$	3500	3.5E-01	$(mg/kg\text{-}day)^{-1}$	B2	IRIS	01/05/2004
PCB-1232 (Aroclor 1232)	1.0E-04	$(ug/m^3)^{-1}$	3500	3.5E-01	$(mg/kg\text{-}day)^{-1}$	B2	IRIS	01/05/2004
Perchlorate	NA	NA	NA	NA	NA	NA	NA	NA
Selenium	NA	NA	NA	NA	NA	D	IRIS	01/05/2004
Silver	NA	NA	NA	NA	NA	D	IRIS	01/05/2004
Thallium	N/A	NA	NA	NA	NA	D	IRIS	01/05/2004
Vanadium	NA	NA	NA	NA	NA	NA	HEAST	07/01/1997

Definitions: NA = Not Available

IRIS = Integrated Risk Information System

NCEA = National Center for Environmental Assessment

Weight of Evidence definitions:

Group A chemicals (known human carcinogens) are agents for which there is sufficient evidence to support the causal association between exposure to the agents in humans and cancer.

Group B1 chemicals (probable human carcinogens) are agents for which there is limited evidence of possible carcinogenicity in humans.

Group B2 chemicals (probable human carcinogens) are agents for which there is sufficient evidence of carcinogenicity in animals but inadequate or a lack of evidence in humans.

Group C chemicals (possible human carcinogens) are agents for which there is limited evidence of carcinogenicity in animals and inadequate or a lack of human data.

Group D chemicals (not classifiable as to human carcinogenicity) are agents with inadequate human and animal evidence of carcinogenicity or for which no data are available.

Group E chemicals (evidence of noncarcinogenicity in humans) are agents for which there is no evidence of carcinogenicity from human or animal studies, or both.

TABLE 7.1.RME

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

REASONABLE MAXIMUM EXPOSURE

SWMU 6 - Mangrove Disposal Site

NASD, Vieques Island, Puerto Rico

Scenario Timeframe: Current/Future
Receptor Population: Recreational
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Surface Soil	Surface Soil	SWMU 6 Surface Soil	Ingestion													
				BENZO(a)ANTHRACENE	6.3E-01	MG/KG	8.7E-08	mg/kg/day	7.3E-01	1/(mg/kg-day)	6.4E-08	2.5E-07	mg/kg/day	NA	NA	NA
				BENZO(a)PYRENE	5.9E-01	MG/KG	8.2E-08	mg/kg/day	7.3E+00	1/(mg/kg-day)	6.0E-07	2.4E-07	mg/kg/day	NA	NA	NA
				BENZO(b)FLUORANTHENE	6.2E-01	MG/KG	8.6E-08	mg/kg/day	7.3E-01	1/(mg/kg-day)	6.3E-08	2.5E-07	mg/kg/day	NA	NA	NA
				DIBENZ(a,h)ANTHRACENE	3.1E-01	MG/KG	4.4E-08	mg/kg/day	7.3E+00	1/(mg/kg-day)	3.2E-07	1.3E-07	mg/kg/day	NA	NA	NA
				INDENO(1,2,3-c,d)PYRENE	4.8E-01	MG/KG	6.7E-08	mg/kg/day	7.3E-01	1/(mg/kg-day)	4.9E-08	2.0E-07	mg/kg/day	NA	NA	NA
				ALUMINUM	8.5E+03	MG/KG	1.2E-03	mg/kg/day	NA	NA	NA	3.5E-03	mg/kg/day	1.0E+00	mg/kg/day	3.5E-03
				ANTIMONY	2.3E+00	MG/KG	3.2E-07	mg/kg/day	NA	NA	NA	9.2E-07	mg/kg/day	4.0E-04	mg/kg/day	2.3E-03
				ARSENIC	3.5E+00	MG/KG	4.9E-07	mg/kg/day	1.5E+00	1/(mg/kg-day)	7.4E-07	1.4E-06	mg/kg/day	3.0E-04	mg/kg/day	4.8E-03
				CHROMIUM, TOTAL	1.9E+01	MG/KG	2.6E-06	mg/kg/day	NA	NA	NA	7.6E-06	mg/kg/day	3.0E-03	mg/kg/day	2.5E-03
				IRON	2.8E+04	MG/KG	3.9E-03	mg/kg/day	NA	NA	NA	1.1E-02	mg/kg/day	3.0E-01	mg/kg/day	3.8E-02
				LEAD	2.8E+02	MG/KG	3.9E-05	mg/kg/day	NA	NA	NA	1.1E-04	mg/kg/day	NA	NA	NA
				MANGANESE	3.4E+02	MG/KG	4.8E-05	mg/kg/day	NA	NA	NA	1.4E-04	mg/kg/day	1.4E-01	mg/kg/day	1.0E-03
				THALLIUM	1.2E+00	MG/KG	1.6E-07	mg/kg/day	NA	NA	NA	4.7E-07	mg/kg/day	8.0E-05	mg/kg/day	5.9E-03
				VANADIUM	4.5E+01	MG/KG	6.3E-06	mg/kg/day	NA	NA	NA	1.8E-05	mg/kg/day	1.0E-03	mg/kg/day	1.8E-02
			Exp. Route Total								1.8E-06					7.6E-02
			Dermal													
				BENZO(a)ANTHRACENE	6.3E-01	MG/KG	1.3E-07	mg/kg/day	7.3E-01	1/(mg/kg-day)	9.4E-08	3.8E-07	mg/kg/day	NA	NA	NA
				BENZO(a)PYRENE	5.9E-01	MG/KG	1.2E-07	mg/kg/day	7.3E+00	1/(mg/kg-day)	8.9E-07	3.6E-07	mg/kg/day	NA	NA	NA
				BENZO(b)FLUORANTHENE	6.2E-01	MG/KG	1.3E-07	mg/kg/day	7.3E-01	1/(mg/kg-day)	9.3E-08	3.7E-07	mg/kg/day	NA	NA	NA
				DIBENZ(a,h)ANTHRACENE	3.1E-01	MG/KG	6.5E-08	mg/kg/day	7.3E+00	1/(mg/kg-day)	4.7E-07	1.9E-07	mg/kg/day	NA	NA	NA
				INDENO(1,2,3-c,d)PYRENE	4.8E-01	MG/KG	9.9E-08	mg/kg/day	7.3E-01	1/(mg/kg-day)	7.3E-08	2.9E-07	mg/kg/day	NA	NA	NA
				ALUMINUM	8.5E+03	MG/KG	1.4E-04	mg/kg/day	NA	NA	NA	4.0E-04	mg/kg/day	1.0E+00	mg/kg/day	4.0E-04
				ANTIMONY	2.3E+00	MG/KG	3.6E-08	mg/kg/day	NA	NA	NA	1.1E-07	mg/kg/day	6.0E-05	mg/kg/day	1.8E-03
				ARSENIC	3.5E+00	MG/KG	1.7E-07	mg/kg/day	1.5E+00	1/(mg/kg-day)	2.5E-07	4.9E-07	mg/kg/day	3.0E-04	mg/kg/day	1.6E-03
				CHROMIUM, TOTAL	1.9E+01	MG/KG	3.0E-07	mg/kg/day	NA	NA	NA	8.6E-07	mg/kg/day	7.5E-05	mg/kg/day	1.1E-02
				IRON	2.8E+04	MG/KG	4.5E-04	mg/kg/day	NA	NA	NA	1.3E-03	mg/kg/day	3.0E-01	mg/kg/day	4.3E-03
				LEAD	2.8E+02	MG/KG	4.5E-06	mg/kg/day	NA	NA	NA	1.3E-05	mg/kg/day	NA	NA	NA
				MANGANESE	3.4E+02	MG/KG	5.5E-06	mg/kg/day	NA	NA	NA	1.6E-05	mg/kg/day	5.6E-03	mg/kg/day	2.8E-03
				THALLIUM	1.2E+00	MG/KG	1.8E-08	mg/kg/day	NA	NA	NA	5.4E-08	mg/kg/day	8.0E-05	mg/kg/day	6.7E-04
				VANADIUM	4.5E+01	MG/KG	7.2E-07	mg/kg/day	NA	NA	NA	2.1E-06	mg/kg/day	2.6E-05	mg/kg/day	8.1E-02
			Exp. Route Total								1.9E-06					1.0E-01

TABLE 7.1.RME

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

REASONABLE MAXIMUM EXPOSURE

SWMU 6 - Mangrove Disposal Site

NASD, Vieques Island, Puerto Rico

Scenario Timeframe: Current/Future
Receptor Population: Recreational
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Surface Soil	Surface Soil	SWMU 6 Surface Soil	Inhalation													
				BENZO(a)ANTHRACENE	6.3E-01	MG/KG	1.3E-11	mg/kg/day	NA	NA	NA	3.7E-11	mg/kg/day	NA	NA	NA
				BENZO(a)PYRENE	5.9E-01	MG/KG	1.2E-11	mg/kg/day	3.1E+00	1/(mg/kg-day)	3.7E-11	3.5E-11	mg/kg/day	NA	NA	NA
				BENZO(b)FLUORANTHENE	6.2E-01	MG/KG	1.3E-11	mg/kg/day	NA	NA	NA	3.7E-11	mg/kg/day	NA	NA	NA
				DIBENZ(a,h)ANTHRACENE	3.1E-01	MG/KG	6.4E-12	mg/kg/day	NA	NA	NA	1.9E-11	mg/kg/day	NA	NA	NA
				INDENO(1,2,3-c,d)PYRENE	4.8E-01	MG/KG	9.9E-12	mg/kg/day	NA	NA	NA	2.9E-11	mg/kg/day	NA	NA	NA
				ALUMINUM	8.5E+03	MG/KG	1.7E-07	mg/kg/day	NA	NA	NA	5.1E-07	mg/kg/day	1.4E-03	mg/kg/day	3.6E-04
				ANTIMONY	2.3E+00	MG/KG	4.6E-11	mg/kg/day	NA	NA	NA	1.4E-10	mg/kg/day	NA	NA	NA
				ARSENIC	3.5E+00	MG/KG	7.2E-11	mg/kg/day	1.5E+01	1/(mg/kg-day)	1.1E-09	2.1E-10	mg/kg/day	NA	NA	NA
				CHROMIUM, TOTAL	1.9E+01	MG/KG	3.8E-10	mg/kg/day	4.2E+01	1/(mg/kg-day)	1.6E-08	1.1E-09	mg/kg/day	1.4E-02	mg/kg/day	7.8E-08
				IRON	2.8E+04	MG/KG	5.7E-07	mg/kg/day	NA	NA	NA	1.7E-06	mg/kg/day	NA	NA	NA
				LEAD	2.8E+02	MG/KG	5.8E-09	mg/kg/day	NA	NA	NA	1.7E-08	mg/kg/day	NA	NA	NA
				MANGANESE	3.4E+02	MG/KG	7.1E-09	mg/kg/day	NA	NA	NA	2.1E-08	mg/kg/day	1.4E-05	mg/kg/day	1.4E-03
				THALLIUM	1.2E+00	MG/KG	2.4E-11	mg/kg/day	NA	NA	NA	6.9E-11	mg/kg/day	NA	NA	NA
				VANADIUM	4.5E+01	MG/KG	9.3E-10	mg/kg/day	NA	NA	NA	2.7E-09	mg/kg/day	NA	NA	NA
			Exp. Route Total								1.7E-08					1.8E-03
		Exposure Point Total									3.7E-06					1.8E-01
	Exposure Medium Total										3.7E-06					1.8E-01
Surface Soil Total											3.7E-06					1.8E-01
Sediment	Sediment	Kiani Lagoon	Ingestion													
				BENZO(a)PYRENE	8.0E-02	MG/KG	2.8E-09	mg/kg/day	7.3E+00	1/(mg/kg-day)	2.0E-08	8.1E-09	mg/kg/day	NA	NA	NA
				ALUMINUM	1.3E+04	MG/KG	4.5E-04	mg/kg/day	NA	NA	NA	1.3E-03	mg/kg/day	1.0E+00	mg/kg/day	1.3E-03
				ANTIMONY	3.8E+01	MG/KG	1.3E-06	mg/kg/day	NA	NA	NA	3.8E-06	mg/kg/day	4.0E-04	mg/kg/day	9.6E-03
				ARSENIC	2.1E+02	MG/KG	7.5E-06	mg/kg/day	1.5E+00	1/(mg/kg-day)	1.1E-05	2.2E-05	mg/kg/day	3.0E-04	mg/kg/day	7.3E-02
				BARIUM	2.2E+02	MG/KG	7.8E-06	mg/kg/day	NA	NA	NA	2.3E-05	mg/kg/day	7.0E-02	mg/kg/day	3.3E-04
				CADMIUM	5.3E+00	MG/KG	1.8E-07	mg/kg/day	NA	NA	NA	5.4E-07	mg/kg/day	1.0E-03	mg/kg/day	5.4E-04
				CHROMIUM, TOTAL	2.2E+01	MG/KG	7.8E-07	mg/kg/day	NA	NA	NA	2.3E-06	mg/kg/day	3.0E-03	mg/kg/day	7.6E-04
				IRON	2.2E+04	MG/KG	7.6E-04	mg/kg/day	NA	NA	NA	2.2E-03	mg/kg/day	3.0E-01	mg/kg/day	7.3E-03
				LEAD	9.9E+01	MG/KG	3.4E-06	mg/kg/day	NA	NA	NA	1.0E-05	mg/kg/day	NA	NA	NA
				MANGANESE	2.7E+02	MG/KG	9.5E-06	mg/kg/day	NA	NA	NA	2.8E-05	mg/kg/day	1.4E-01	mg/kg/day	2.0E-04
				SELENIUM	2.1E+02	MG/KG	7.3E-06	mg/kg/day	NA	NA	NA	2.1E-05	mg/kg/day	5.0E-03	mg/kg/day	4.2E-03
				THALLIUM	3.3E+02	MG/KG	1.2E-05	mg/kg/day	NA	NA	NA	3.4E-05	mg/kg/day	8.0E-05	mg/kg/day	4.2E-01
				VANADIUM	5.4E+01	MG/KG	1.9E-06	mg/kg/day	NA	NA	NA	5.5E-06	mg/kg/day	1.0E-03	mg/kg/day	5.5E-03
			Exp. Route Total								1.1E-05					5.2E-01

TABLE 7.1.RME

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

REASONABLE MAXIMUM EXPOSURE

SWMU 6 - Mangrove Disposal Site

NASD, Vieques Island, Puerto Rico

Scenario Timeframe: Current/Future
Receptor Population: Recreational
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Sediment	Sediment	Kiani Lagoon	Dermal													
				BENZO(a)PYRENE	8.0E-02	MG/KG	1.3E-09	mg/kg/day	7.3E+00	1/(mg/kg-day)	9.8E-09	3.9E-09	mg/kg/day	NA	NA	NA
				ALUMINUM	1.3E+04	MG/KG	1.7E-04	mg/kg/day	NA	NA	NA	4.9E-04	mg/kg/day	1.0E+00	mg/kg/day	4.9E-04
				ANTIMONY	3.8E+01	MG/KG	4.9E-07	mg/kg/day	NA	NA	NA	1.4E-06	mg/kg/day	6.0E-05	mg/kg/day	2.4E-02
				ARSENIC	2.1E+02	MG/KG	8.4E-06	mg/kg/day	1.5E+00	1/(mg/kg-day)	1.3E-05	2.4E-05	mg/kg/day	3.0E-04	mg/kg/day	8.1E-02
				BARIUM	2.2E+02	MG/KG	2.9E-06	mg/kg/day	NA	NA	NA	8.5E-06	mg/kg/day	4.9E-03	mg/kg/day	1.7E-03
				CADMIUM	5.3E+00	MG/KG	6.9E-08	mg/kg/day	NA	NA	NA	2.0E-07	mg/kg/day	2.5E-05	mg/kg/day	8.0E-03
				CHROMIUM, TOTAL	2.2E+01	MG/KG	2.9E-07	mg/kg/day	NA	NA	NA	8.5E-07	mg/kg/day	7.5E-05	mg/kg/day	1.1E-02
				IRON	2.2E+04	MG/KG	2.8E-04	mg/kg/day	NA	NA	NA	8.2E-04	mg/kg/day	3.0E-01	mg/kg/day	2.7E-03
				LEAD	9.9E+01	MG/KG	1.3E-06	mg/kg/day	NA	NA	NA	3.7E-06	mg/kg/day	NA	NA	NA
				MANGANESE	2.7E+02	MG/KG	3.5E-06	mg/kg/day	NA	NA	NA	1.0E-05	mg/kg/day	5.6E-03	mg/kg/day	1.8E-03
				SELENIUM	2.1E+02	MG/KG	2.7E-06	mg/kg/day	NA	NA	NA	7.9E-06	mg/kg/day	5.0E-03	mg/kg/day	1.6E-03
				THALLIUM	3.3E+02	MG/KG	4.3E-06	mg/kg/day	NA	NA	NA	1.2E-05	mg/kg/day	8.0E-05	mg/kg/day	1.6E-01
				VANADIUM	5.4E+01	MG/KG	7.1E-07	mg/kg/day	NA	NA	NA	2.1E-06	mg/kg/day	2.6E-05	mg/kg/day	7.9E-02
			Exp. Route Total								1.3E-05					3.7E-01
		Exposure Point Total									2.4E-05					8.9E-01
	Exposure Medium Total										2.4E-05					8.9E-01
Sediment Total											2.4E-05					8.9E-01
Surface Water	Surface Water	Kiani Lagoon	Ingestion													
				ARSENIC	5.3E+00	UG/L	2.4E-07	mg/kg/day	1.5E+00	1/(mg/kg-day)	3.6E-07	7.0E-07	mg/kg/day	3.0E-04	mg/kg/day	2.3E-03
				IRON	1.0E+03	UG/L	4.6E-05	mg/kg/day	NA	NA	NA	1.3E-04	mg/kg/day	3.0E-01	mg/kg/day	4.5E-04
				MERCURY	1.5E+00	UG/L	6.6E-08	mg/kg/day	NA	NA	NA	1.9E-07	mg/kg/day	3.0E-04	mg/kg/day	6.4E-04
				THALLIUM	4.9E+00	UG/L	2.2E-07	mg/kg/day	NA	NA	NA	6.5E-07	mg/kg/day	8.0E-05	mg/kg/day	8.1E-03
			Exp. Route Total								3.6E-07					1.2E-02
			Dermal													
				ARSENIC	5.3E+00	UG/L	5.0E-08	mg/kg/day	1.5E+00	1/(mg/kg-day)	7.5E-08	1.4E-07	mg/kg/day	3.0E-04	mg/kg/day	4.8E-04
				IRON	1.0E+03	UG/L	9.5E-06	mg/kg/day	NA	NA	NA	2.8E-05	mg/kg/day	3.0E-01	mg/kg/day	9.2E-05
				MERCURY	1.5E+00	UG/L	1.4E-08	mg/kg/day	NA	NA	NA	4.0E-08	mg/kg/day	2.1E-05	mg/kg/day	1.9E-03
				THALLIUM	4.9E+00	UG/L	4.6E-08	mg/kg/day	NA	NA	NA	1.3E-07	mg/kg/day	8.0E-05	mg/kg/day	1.7E-03
			Exp. Route Total								7.5E-08					4.1E-03
		Exposure Point Total									4.4E-07					1.6E-02
Surface Water Total											4.4E-07					1.6E-02
										Total of Receptor Risks Across All Media	2.8E-05			Total of Receptor Hazards Across All Media		1.1E+00

NA = Not applicable.

Table 7.1.RME Supplement
Calculation of DAevent
Recreational Adult, Youth, and Child Surface Water
SWMU 6 - Mangrove Disposal Site
NASD, Vieques Island, Puerto Rico

Chemical of Potential Concern	Surface Water Concentration (CW) (ug/L)	Permeability Coefficient (Kp) (cm/hr)	B (dimensionless)	Lag Time (τ_{event}) (hr)	t* (hr)	Fraction Absorbed Water (FA) (dimensionless)	Duration of Event (tevent) (hr)	DAevent (mg/cm^2-event)	Eq
ARSENIC	5.3E+00	1.0E-03	NA	NA	NA	NA	2.6	1.4E-08	1
IRON	1.0E+03	1.0E-03	NA	NA	NA	NA	2.6	2.6E-06	1
MERCURY	1.5E+00	1.0E-03	NA	NA	NA	NA	2.6	3.8E-09	1
THALLIUM	4.9E+00	1.0E-03	NA	NA	NA	NA	2.6	1.3E-08	1

Inorganics: DAevent (mg/cm2-event) =

Kp x CW x tevent x 0.001 mg/ug x 0.001 l/cm^3 (eq 1)

Organics: DAevent (mg/cm2-event) =

$$\text{If } t_{event} \le t^*, \text{then } DA_{event} = 2 \times FA \times K_p \times C_w \sqrt{\frac{6 \times \tau_{event} \times t_{event}}{\pi}} \qquad \text{(eq 2)}$$

$$\text{If } t_{event} \ge t^*, \text{then } DA_{event} = FA \times K_p \times C_w \left[\frac{t_{event}}{1+B} + 2 \times \tau_{event} \left(\frac{1+3B+3B^2}{(1+B)^2} \right) \right] \qquad \text{(eq 3)}$$

Notes:

Permeability constants from EPA 2001, *Risk Assessment Guidance for Superfund Volume I: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment - Interim).* EPA/540/R/99/005. The default value of 0.001 was assigned to inorganics not listed in this document.

NA - not applicable.

TABLE 7.2.RME

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

REASONABLE MAXIMUM EXPOSURE

SWMU 6 - Mangrove Disposal Site

NASD, Vieques Island, Puerto Rico

Scenario Timeframe: Current/Future
Receptor Population: Recreational
Receptor Age: Youth

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Surface Soil	Surface Soil	SWMU 6 Surface Soil	Ingestion													
				BENZO(a)ANTHRACENE	6.3E-01	MG/KG	5.0E-08	mg/kg/day	7.3E-01	1/(mg/kg-day)	3.6E-08	3.5E-07	mg/kg/day	NA	NA	NA
				BENZO(a)PYRENE	5.9E-01	MG/KG	4.7E-08	mg/kg/day	7.3E+00	1/(mg/kg-day)	3.4E-07	3.3E-07	mg/kg/day	NA	NA	NA
				BENZO(b)FLUORANTHENE	6.2E-01	MG/KG	4.9E-08	mg/kg/day	7.3E-01	1/(mg/kg-day)	3.6E-08	3.4E-07	mg/kg/day	NA	NA	NA
				DIBENZ(a,h)ANTHRACENE	3.1E-01	MG/KG	2.5E-08	mg/kg/day	7.3E+00	1/(mg/kg-day)	1.8E-07	1.8E-07	mg/kg/day	NA	NA	NA
				INDENO(1,2,3-c,d)PYRENE	4.8E-01	MG/KG	3.8E-08	mg/kg/day	7.3E-01	1/(mg/kg-day)	2.8E-08	2.7E-07	mg/kg/day	NA	NA	NA
				ALUMINUM	8.5E+03	MG/KG	6.8E-04	mg/kg/day	NA	NA	NA	4.8E-03	mg/kg/day	1.0E+00	mg/kg/day	4.8E-03
				ANTIMONY	2.3E+00	MG/KG	1.8E-07	mg/kg/day	NA	NA	NA	1.3E-06	mg/kg/day	4.0E-04	mg/kg/day	3.2E-03
				ARSENIC	3.5E+00	MG/KG	2.8E-07	mg/kg/day	1.5E+00	1/(mg/kg-day)	4.2E-07	2.0E-06	mg/kg/day	3.0E-04	mg/kg/day	6.5E-03
				CHROMIUM, TOTAL	1.9E+01	MG/KG	1.5E-06	mg/kg/day	NA	NA	NA	1.0E-05	mg/kg/day	3.0E-03	mg/kg/day	3.5E-03
				IRON	2.8E+04	MG/KG	2.2E-03	mg/kg/day	NA	NA	NA	1.6E-02	mg/kg/day	3.0E-01	mg/kg/day	5.2E-02
				LEAD	2.8E+02	MG/KG	2.2E-05	mg/kg/day	NA	NA	NA	1.6E-04	mg/kg/day	NA	NA	NA
				MANGANESE	3.4E+02	MG/KG	2.7E-05	mg/kg/day	NA	NA	NA	1.9E-04	mg/kg/day	1.4E-01	mg/kg/day	1.4E-03
				THALLIUM	1.2E+00	MG/KG	9.2E-08	mg/kg/day	NA	NA	NA	6.4E-07	mg/kg/day	8.0E-05	mg/kg/day	8.1E-03
				VANADIUM	4.5E+01	MG/KG	3.6E-06	mg/kg/day	NA	NA	NA	2.5E-05	mg/kg/day	1.0E-03	mg/kg/day	2.5E-02
			Exp. Route Total								1.0E-06					1.0E-01
			Dermal													
				BENZO(a)ANTHRACENE	6.3E-01	MG/KG	8.6E-08	mg/kg/day	7.3E-01	1/(mg/kg-day)	6.3E-08	6.0E-07	mg/kg/day	NA	NA	NA
				BENZO(a)PYRENE	5.9E-01	MG/KG	8.1E-08	mg/kg/day	7.3E+00	1/(mg/kg-day)	5.9E-07	5.7E-07	mg/kg/day	NA	NA	NA
				BENZO(b)FLUORANTHENE	6.2E-01	MG/KG	8.4E-08	mg/kg/day	7.3E-01	1/(mg/kg-day)	6.2E-08	5.9E-07	mg/kg/day	NA	NA	NA
				DIBENZ(a,h)ANTHRACENE	3.1E-01	MG/KG	4.3E-08	mg/kg/day	7.3E+00	1/(mg/kg-day)	3.1E-07	3.0E-07	mg/kg/day	NA	NA	NA
				INDENO(1,2,3-c,d)PYRENE	4.8E-01	MG/KG	6.6E-08	mg/kg/day	7.3E-01	1/(mg/kg-day)	4.8E-08	4.6E-07	mg/kg/day	NA	NA	NA
				ALUMINUM	8.5E+03	MG/KG	9.0E-05	mg/kg/day	NA	NA	NA	6.3E-04	mg/kg/day	1.0E+00	mg/kg/day	6.3E-04
				ANTIMONY	2.3E+00	MG/KG	2.4E-08	mg/kg/day	NA	NA	NA	1.7E-07	mg/kg/day	6.0E-05	mg/kg/day	2.8E-03
				ARSENIC	3.5E+00	MG/KG	1.1E-07	mg/kg/day	1.5E+00	1/(mg/kg-day)	1.7E-07	7.8E-07	mg/kg/day	3.0E-04	mg/kg/day	2.6E-03
				CHROMIUM, TOTAL	1.9E+01	MG/KG	2.0E-07	mg/kg/day	NA	NA	NA	1.4E-06	mg/kg/day	7.5E-05	mg/kg/day	1.8E-02
				IRON	2.8E+04	MG/KG	2.9E-04	mg/kg/day	NA	NA	NA	2.1E-03	mg/kg/day	3.0E-01	mg/kg/day	6.9E-03
				LEAD	2.8E+02	MG/KG	3.0E-06	mg/kg/day	NA	NA	NA	2.1E-05	mg/kg/day	NA	NA	NA
				MANGANESE	3.4E+02	MG/KG	3.6E-06	mg/kg/day	NA	NA	NA	2.5E-05	mg/kg/day	5.6E-03	mg/kg/day	4.5E-03
				THALLIUM	1.2E+00	MG/KG	1.2E-08	mg/kg/day	NA	NA	NA	8.5E-08	mg/kg/day	8.0E-05	mg/kg/day	1.1E-03
				VANADIUM	4.5E+01	MG/KG	4.8E-07	mg/kg/day	NA	NA	NA	3.3E-06	mg/kg/day	2.6E-05	mg/kg/day	1.3E-01
			Exp. Route Total								1.2E-06					1.7E-01

TABLE 7.2.RME
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURE
SWMU 6 - Mangrove Disposal Site
NASD, Vieques Island, Puerto Rico

Scenario Timeframe: Current/Future
Receptor Population: Recreational
Receptor Age: Youth

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Surface Soil	Surface Soil	SWMU 6 Surface Soil	Inhalation													
				BENZO(a)ANTHRACENE	6.3E-01	MG/KG	7.3E-12	mg/kg/day	NA	NA	NA	5.1E-11	mg/kg/day	NA	NA	NA
				BENZO(a)PYRENE	5.9E-01	MG/KG	6.9E-12	mg/kg/day	3.1E+00	1/(mg/kg-day)	2.1E-11	4.8E-11	mg/kg/day	NA	NA	NA
				BENZO(b)FLUORANTHENE	6.2E-01	MG/KG	7.2E-12	mg/kg/day	NA	NA	NA	5.1E-11	mg/kg/day	NA	NA	NA
				DIBENZ(a,h)ANTHRACENE	3.1E-01	MG/KG	3.7E-12	mg/kg/day	NA	NA	NA	2.6E-11	mg/kg/day	NA	NA	NA
				INDENO(1,2,3-c,d)PYRENE	4.8E-01	MG/KG	5.6E-12	mg/kg/day	NA	NA	NA	4.0E-11	mg/kg/day	NA	NA	NA
				ALUMINUM	8.5E+03	MG/KG	1.0E-07	mg/kg/day	NA	NA	NA	7.0E-07	mg/kg/day	1.4E-03	mg/kg/day	4.9E-04
				ANTIMONY	2.3E+00	MG/KG	2.7E-11	mg/kg/day	NA	NA	NA	1.9E-10	mg/kg/day	NA	NA	NA
				ARSENIC	3.5E+00	MG/KG	4.1E-11	mg/kg/day	1.5E+01	1/(mg/kg-day)	6.2E-10	2.9E-10	mg/kg/day	NA	NA	NA
				CHROMIUM, TOTAL	1.9E+01	MG/KG	2.2E-10	mg/kg/day	4.2E+01	1/(mg/kg-day)	9.2E-09	1.5E-09	mg/kg/day	1.4E-02	mg/kg/day	1.1E-07
				IRON	2.8E+04	MG/KG	3.3E-07	mg/kg/day	NA	NA	NA	2.3E-06	mg/kg/day	NA	NA	NA
				LEAD	2.8E+02	MG/KG	3.3E-09	mg/kg/day	NA	NA	NA	2.3E-08	mg/kg/day	NA	NA	NA
				MANGANESE	3.4E+02	MG/KG	4.0E-09	mg/kg/day	NA	NA	NA	2.8E-08	mg/kg/day	1.4E-05	mg/kg/day	2.0E-03
				THALLIUM	1.2E+00	MG/KG	1.4E-11	mg/kg/day	NA	NA	NA	9.5E-11	mg/kg/day	NA	NA	NA
				VANADIUM	4.5E+01	MG/KG	5.3E-10	mg/kg/day	NA	NA	NA	3.7E-09	mg/kg/day	NA	NA	NA
			Exp. Route Total								9.8E-09					2.5E-03
		Exposure Point Total									2.3E-06					2.7E-01
	Exposure Medium Total										2.3E-06					2.7E-01
Surface Soil Total											2.3E-06					2.7E-01
Sediment	Sediment	Kiani Lagoon	Ingestion													
				BENZO(a)PYRENE	8.0E-02	MG/KG	1.6E-09	mg/kg/day	7.3E+00	1/(mg/kg-day)	1.2E-08	1.1E-08	NA	NA	NA	NA
				ALUMINUM	1.3E+04	MG/KG	2.6E-04	mg/kg/day	NA	NA	NA	1.8E-03	1.0E+00	1.0E+00	mg/kg/day	1.8E-03
				ANTIMONY	3.8E+01	MG/KG	7.5E-07	mg/kg/day	NA	NA	NA	5.3E-06	4.0E-04	4.0E-04	mg/kg/day	1.3E-02
				ARSENIC	2.1E+02	MG/KG	4.3E-06	mg/kg/day	1.5E+00	1/(mg/kg-day)	6.4E-06	3.0E-05	3.0E-04	3.0E-04	mg/kg/day	1.0E-01
				BARIUM	2.2E+02	MG/KG	4.5E-06	mg/kg/day	NA	NA	NA	3.1E-05	7.0E-02	7.0E-02	mg/kg/day	4.5E-04
				CADMIUM	5.3E+00	MG/KG	1.1E-07	mg/kg/day	NA	NA	NA	7.4E-07	1.0E-03	1.0E-03	mg/kg/day	7.4E-04
				CHROMIUM, TOTAL	2.2E+01	MG/KG	4.5E-07	mg/kg/day	NA	NA	NA	3.1E-06	3.0E-03	3.0E-03	mg/kg/day	1.0E-03
				IRON	2.2E+04	MG/KG	4.3E-04	mg/kg/day	NA	NA	NA	3.0E-03	3.0E-01	3.0E-01	mg/kg/day	1.0E-02
				LEAD	9.9E+01	MG/KG	2.0E-06	mg/kg/day	NA	NA	NA	1.4E-05	NA	NA	NA	NA
				MANGANESE	2.7E+02	MG/KG	5.4E-06	mg/kg/day	NA	NA	NA	3.8E-05	1.4E-01	1.4E-01	mg/kg/day	2.7E-04
				SELENIUM	2.1E+02	MG/KG	4.1E-06	mg/kg/day	NA	NA	NA	2.9E-05	5.0E-03	5.0E-03	mg/kg/day	5.8E-03
				THALLIUM	3.3E+02	MG/KG	6.6E-06	mg/kg/day	NA	NA	NA	4.6E-05	8.0E-05	8.0E-05	mg/kg/day	5.8E-01
				VANADIUM	5.4E+01	MG/KG	1.1E-06	mg/kg/day	NA	NA	NA	7.6E-06	#REF!	1.0E-03	mg/kg/day	7.6E-03
			Exp. Route Total								6.4E-06					7.2E-01

TABLE 7.2.RME

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

REASONABLE MAXIMUM EXPOSURE

SWMU 6 - Mangrove Disposal Site

NASD, Vieques Island, Puerto Rico

Scenario Timeframe: Current/Future
Receptor Population: Recreational
Receptor Age: Youth

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Sediment	Sediment	Kiani Lagoon	Dermal	BENZO(a)PYRENE	8.0E-02	MG/KG	7.7E-10	mg/kg/day	7.3E+00	1/(mg/kg-day)	5.6E-09	5.4E-09	NA	NA	NA	NA
				ALUMINUM	1.3E+04	MG/KG	9.6E-05	mg/kg/day	NA	NA	NA	6.7E-04	1.0E+00	1.0E+00	mg/kg/day	6.7E-04
				ANTIMONY	3.8E+01	MG/KG	2.8E-07	mg/kg/day	NA	NA	NA	2.0E-06	6.0E-05	6.0E-05	mg/kg/day	3.3E-02
				ARSENIC	2.1E+02	MG/KG	4.8E-06	mg/kg/day	1.5E+00	1/(mg/kg-day)	7.2E-06	3.3E-05	3.0E-04	3.0E-04	mg/kg/day	1.1E-01
				BARIUM	2.2E+02	MG/KG	1.7E-06	mg/kg/day	NA	NA	NA	1.2E-05	4.9E-03	4.9E-03	mg/kg/day	2.4E-03
				CADMIUM	5.3E+00	MG/KG	3.9E-08	mg/kg/day	NA	NA	NA	2.8E-07	2.5E-05	2.5E-05	mg/kg/day	1.1E-02
				CHROMIUM, TOTAL	2.2E+01	MG/KG	1.7E-07	mg/kg/day	NA	NA	NA	1.2E-06	7.5E-05	7.5E-05	mg/kg/day	1.6E-02
				IRON	2.2E+04	MG/KG	1.6E-04	mg/kg/day	NA	NA	NA	1.1E-03	3.0E-01	3.0E-01	mg/kg/day	3.8E-03
				LEAD	9.9E+01	MG/KG	7.3E-07	mg/kg/day	NA	NA	NA	5.1E-06	NA	NA	NA	NA
				MANGANESE	2.7E+02	MG/KG	2.0E-06	mg/kg/day	NA	NA	NA	1.4E-05	5.6E-03	5.6E-03	mg/kg/day	2.5E-03
				SELENIUM	2.1E+02	MG/KG	1.5E-06	mg/kg/day	NA	NA	NA	1.1E-05	5.0E-03	5.0E-03	mg/kg/day	2.2E-03
				THALLIUM	3.3E+02	MG/KG	2.4E-06	mg/kg/day	NA	NA	NA	1.7E-05	8.0E-05	8.0E-05	mg/kg/day	2.1E-01
				VANADIUM	5.4E+01	MG/KG	4.0E-07	mg/kg/day	NA	NA	NA	2.8E-06	#REF!	2.6E-05	mg/kg/day	1.1E-01
			Exp. Route Total								7.2E-06					5.0E-01
		Exposure Point Total									1.4E-05					1.2E+00
	Exposure Medium Total										1.4E-05					1.2E+00
Sediment Total											1.4E-05					1.2E+00
Surface Water	Surface Water	Kiani Lagoon	Ingestion	ARSENIC	5.3E+00	UG/L	1.4E-07	mg/kg/day	1.5E+00	1/(mg/kg-day)	2.1E-07	9.6E-07	mg/kg/day	3.0E-04	mg/kg/day	3.2E-03
				IRON	1.0E+03	UG/L	2.6E-05	mg/kg/day	NA	NA	NA	1.8E-04	mg/kg/day	3.0E-01	mg/kg/day	6.1E-04
				MERCURY	1.5E+00	UG/L	3.8E-08	mg/kg/day	NA	NA	NA	2.6E-07	mg/kg/day	3.0E-04	mg/kg/day	8.8E-04
				THALLIUM	4.9E+00	UG/L	1.3E-07	mg/kg/day	NA	NA	NA	8.9E-07	mg/kg/day	8.0E-05	mg/kg/day	1.1E-02
			Exp. Route Total								2.1E-07					1.6E-02
			Dermal	ARSENIC	5.3E+00	UG/L	2.2E-08	mg/kg/day	1.5E+00	1/(mg/kg-day)	3.3E-08	1.5E-07	mg/kg/day	3.0E-04	mg/kg/day	5.1E-04
				IRON	1.0E+03	UG/L	4.2E-06	mg/kg/day	NA	NA	NA	2.9E-05	mg/kg/day	3.0E-01	mg/kg/day	9.8E-05
				MERCURY	1.5E+00	UG/L	6.0E-09	mg/kg/day	NA	NA	NA	4.2E-08	mg/kg/day	2.1E-05	mg/kg/day	2.0E-03
				THALLIUM	4.9E+00	UG/L	2.0E-08	mg/kg/day	NA	NA	NA	1.4E-07	mg/kg/day	8.0E-05	mg/kg/day	1.8E-03
			Exp. Route Total								3.3E-08					4.4E-03
		Exposure Point Total									2.4E-07					2.0E-02
Surface Water Total											2.4E-07					2.0E-02
										Total of Receptor Risks Across All Media	1.6E-05			Total of Receptor Hazards Across All Media		1.5E+00

NA = Not applicable.

TABLE 7.3.RME

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

REASONABLE MAXIMUM EXPOSURE

SWMU 6 - Mangrove Disposal Site

NASD, Vieques Island, Puerto Rico

Scenario Timeframe: Current/Future
Receptor Population: Recreational
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Surface Soil	Surface Soil	SWMU 6 Surface Soil	Ingestion													
				BENZO(a)ANTHRACENE	6.3E-01	MG/KG	2.0E-07	mg/kg/day	7.3E-01	1/(mg/kg-day)	1.5E-07	2.4E-06	mg/kg/day	NA	NA	NA
				BENZO(a)PYRENE	5.9E-01	MG/KG	1.9E-07	mg/kg/day	7.3E+00	1/(mg/kg-day)	1.4E-06	2.2E-06	mg/kg/day	NA	NA	NA
				BENZO(b)FLUORANTHENE	6.2E-01	MG/KG	2.0E-07	mg/kg/day	7.3E-01	1/(mg/kg-day)	1.5E-07	2.3E-06	mg/kg/day	NA	NA	NA
				DIBENZ(a,h)ANTHRACENE	3.1E-01	MG/KG	1.0E-07	mg/kg/day	7.3E+00	1/(mg/kg-day)	7.5E-07	1.2E-06	mg/kg/day	NA	NA	NA
				INDENO(1,2,3-c,d)PYRENE	4.8E-01	MG/KG	1.6E-07	mg/kg/day	7.3E-01	1/(mg/kg-day)	1.1E-07	1.8E-06	mg/kg/day	NA	NA	NA
				ALUMINUM	8.5E+03	MG/KG	2.8E-03	mg/kg/day	NA	NA	NA	3.2E-02	mg/kg/day	1.0E+00	mg/kg/day	3.2E-02
				ANTIMONY	2.3E+00	MG/KG	7.4E-07	mg/kg/day	NA	NA	NA	8.6E-06	mg/kg/day	4.0E-04	mg/kg/day	2.1E-02
				ARSENIC	3.5E+00	MG/KG	1.1E-06	mg/kg/day	1.5E+00	1/(mg/kg-day)	1.7E-06	1.3E-05	mg/kg/day	3.0E-04	mg/kg/day	4.4E-02
				CHROMIUM, TOTAL	1.9E+01	MG/KG	6.0E-06	mg/kg/day	NA	NA	NA	7.1E-05	mg/kg/day	3.0E-03	mg/kg/day	2.4E-02
				IRON	2.8E+04	MG/KG	9.1E-03	mg/kg/day	NA	NA	NA	1.1E-01	mg/kg/day	3.0E-01	mg/kg/day	3.5E-01
				LEAD	2.8E+02	MG/KG	9.2E-05	mg/kg/day	NA	NA	NA	1.1E-03	mg/kg/day	NA	NA	NA
				MANGANESE	3.4E+02	MG/KG	1.1E-04	mg/kg/day	NA	NA	NA	1.3E-03	mg/kg/day	1.4E-01	mg/kg/day	9.3E-03
				THALLIUM	1.2E+00	MG/KG	3.8E-07	mg/kg/day	NA	NA	NA	4.4E-06	mg/kg/day	8.0E-05	mg/kg/day	5.5E-02
				VANADIUM	4.5E+01	MG/KG	1.5E-05	mg/kg/day	NA	NA	NA	1.7E-04	mg/kg/day	1.0E-03	mg/kg/day	1.7E-01
			Exp. Route Total								4.3E-06					7.1E-01
			Dermal													
				BENZO(a)ANTHRACENE	6.3E-01	MG/KG	7.4E-08	mg/kg/day	7.3E-01	1/(mg/kg-day)	5.4E-08	8.7E-07	mg/kg/day	NA	NA	NA
				BENZO(a)PYRENE	5.9E-01	MG/KG	7.0E-08	mg/kg/day	7.3E+00	1/(mg/kg-day)	5.1E-07	8.2E-07	mg/kg/day	NA	NA	NA
				BENZO(b)FLUORANTHENE	6.2E-01	MG/KG	7.3E-08	mg/kg/day	7.3E-01	1/(mg/kg-day)	5.3E-08	8.5E-07	mg/kg/day	NA	NA	NA
				DIBENZ(a,h)ANTHRACENE	3.1E-01	MG/KG	3.7E-08	mg/kg/day	7.3E+00	1/(mg/kg-day)	2.7E-07	4.3E-07	mg/kg/day	NA	NA	NA
				INDENO(1,2,3-c,d)PYRENE	4.8E-01	MG/KG	5.7E-08	mg/kg/day	7.3E-01	1/(mg/kg-day)	4.2E-08	6.7E-07	mg/kg/day	NA	NA	NA
				ALUMINUM	8.5E+03	MG/KG	7.8E-05	mg/kg/day	NA	NA	NA	9.1E-04	mg/kg/day	1.0E+00	mg/kg/day	9.1E-04
				ANTIMONY	2.3E+00	MG/KG	2.1E-08	mg/kg/day	NA	NA	NA	2.4E-07	mg/kg/day	6.0E-05	mg/kg/day	4.0E-03
				ARSENIC	3.5E+00	MG/KG	9.6E-08	mg/kg/day	1.5E+00	1/(mg/kg-day)	1.4E-07	1.1E-06	mg/kg/day	3.0E-04	mg/kg/day	3.7E-03
				CHROMIUM, TOTAL	1.9E+01	MG/KG	1.7E-07	mg/kg/day	NA	NA	NA	2.0E-06	mg/kg/day	7.5E-05	mg/kg/day	2.6E-02
				IRON	2.8E+04	MG/KG	2.6E-04	mg/kg/day	NA	NA	NA	3.0E-03	mg/kg/day	3.0E-01	mg/kg/day	9.9E-03
				LEAD	2.8E+02	MG/KG	2.6E-06	mg/kg/day	NA	NA	NA	3.0E-05	mg/kg/day	NA	NA	NA
				MANGANESE	3.4E+02	MG/KG	3.1E-06	mg/kg/day	NA	NA	NA	3.7E-05	mg/kg/day	5.6E-03	mg/kg/day	6.5E-03
				THALLIUM	1.2E+00	MG/KG	1.1E-08	mg/kg/day	NA	NA	NA	1.2E-07	mg/kg/day	8.0E-05	mg/kg/day	1.5E-03
				VANADIUM	4.5E+01	MG/KG	4.1E-07	mg/kg/day	NA	NA	NA	4.8E-06	mg/kg/day	2.6E-05	mg/kg/day	1.9E-01
			Exp. Route Total								1.1E-06					2.4E-01

TABLE 7.3.RME

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

REASONABLE MAXIMUM EXPOSURE

SWMU 6 - Mangrove Disposal Site

NASD, Vieques Island, Puerto Rico

Scenario Timeframe: Current/Future
Receptor Population: Recreational
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Surface Soil	Surface Soil	SWMU 6 Surface Soil	Inhalation													
				BENZO(a)ANTHRACENE	6.3E-01	MG/KG	7.5E-12	mg/kg/day	NA	NA	NA	8.7E-11	mg/kg/day	NA	NA	NA
				BENZO(a)PYRENE	5.9E-01	MG/KG	7.1E-12	mg/kg/day	3.1E+00	1/(mg/kg-day)	2.2E-11	8.2E-11	mg/kg/day	NA	NA	NA
				BENZO(b)FLUORANTHENE	6.2E-01	MG/KG	7.4E-12	mg/kg/day	NA	NA	NA	8.6E-11	mg/kg/day	NA	NA	NA
				DIBENZ(a,h)ANTHRACENE	3.1E-01	MG/KG	3.8E-12	mg/kg/day	NA	NA	NA	4.4E-11	mg/kg/day	NA	NA	NA
				INDENO(1,2,3-c,d)PYRENE	4.8E-01	MG/KG	5.8E-12	mg/kg/day	NA	NA	NA	6.7E-11	mg/kg/day	NA	NA	NA
				ALUMINUM	8.5E+03	MG/KG	1.0E-07	mg/kg/day	NA	NA	NA	1.2E-06	mg/kg/day	1.4E-03	mg/kg/day	8.3E-04
				ANTIMONY	2.3E+00	MG/KG	2.7E-11	mg/kg/day	NA	NA	NA	3.2E-10	mg/kg/day	NA	NA	NA
				ARSENIC	3.5E+00	MG/KG	4.2E-11	mg/kg/day	1.5E+01	1/(mg/kg-day)	6.3E-10	4.9E-10	mg/kg/day	NA	NA	NA
				CHROMIUM, TOTAL	1.9E+01	MG/KG	2.2E-10	mg/kg/day	4.2E+01	1/(mg/kg-day)	9.3E-09	2.6E-09	mg/kg/day	1.4E-02	mg/kg/day	1.8E-07
				IRON	2.8E+04	MG/KG	3.3E-07	mg/kg/day	NA	NA	NA	3.9E-06	mg/kg/day	NA	NA	NA
				LEAD	2.8E+02	MG/KG	3.4E-09	mg/kg/day	NA	NA	NA	3.9E-08	mg/kg/day	NA	NA	NA
				MANGANESE	3.4E+02	MG/KG	4.1E-09	mg/kg/day	NA	NA	NA	4.8E-08	mg/kg/day	1.4E-05	mg/kg/day	3.4E-03
				THALLIUM	1.2E+00	MG/KG	1.4E-11	mg/kg/day	NA	NA	NA	1.6E-10	mg/kg/day	NA	NA	NA
				VANADIUM	4.5E+01	MG/KG	5.4E-10	mg/kg/day	NA	NA	NA	6.3E-09	mg/kg/day	NA	NA	NA
			Exp. Route Total								1.0E-08					4.2E-03
		Exposure Point Total									5.4E-06					9.5E-01
	Exposure Medium Total										5.4E-06					9.5E-01
Surface Soil Total											5.4E-06					9.5E-01
Sediment	Sediment	Kiani Lagoon	Ingestion													
				BENZO(a)PYRENE	8.0E-02	MG/KG	6.5E-09	mg/kg/day	7.3E+00	1/(mg/kg-day)	4.7E-08	7.6E-08	mg/kg/day	NA	NA	NA
				ALUMINUM	1.3E+04	MG/KG	1.1E-03	mg/kg/day	NA	NA	NA	1.2E-02	mg/kg/day	1.0E+00	mg/kg/day	1.2E-02
				ANTIMONY	3.8E+01	MG/KG	3.1E-06	mg/kg/day	NA	NA	NA	3.6E-05	mg/kg/day	4.0E-04	mg/kg/day	8.9E-02
				ARSENIC	2.1E+02	MG/KG	1.7E-05	mg/kg/day	1.5E+00	1/(mg/kg-day)	2.6E-05	2.0E-04	mg/kg/day	3.0E-04	mg/kg/day	6.8E-01
				BARIUM	2.2E+02	MG/KG	1.8E-05	mg/kg/day	NA	NA	NA	2.1E-04	mg/kg/day	7.0E-02	mg/kg/day	3.0E-03
				CADMIUM	5.3E+00	MG/KG	4.3E-07	mg/kg/day	NA	NA	NA	5.0E-06	mg/kg/day	1.0E-03	mg/kg/day	5.0E-03
				CHROMIUM, TOTAL	2.2E+01	MG/KG	1.8E-06	mg/kg/day	NA	NA	NA	2.1E-05	mg/kg/day	3.0E-03	mg/kg/day	7.1E-03
				IRON	2.2E+04	MG/KG	1.8E-03	mg/kg/day	NA	NA	NA	2.1E-02	mg/kg/day	3.0E-01	mg/kg/day	6.9E-02
				LEAD	9.9E+01	MG/KG	8.0E-06	mg/kg/day	NA	NA	NA	9.4E-05	mg/kg/day	NA	NA	NA
				MANGANESE	2.7E+02	MG/KG	2.2E-05	mg/kg/day	NA	NA	NA	2.6E-04	mg/kg/day	1.4E-01	mg/kg/day	1.8E-03
				SELENIUM	2.1E+02	MG/KG	1.7E-05	mg/kg/day	NA	NA	NA	2.0E-04	mg/kg/day	5.0E-03	mg/kg/day	3.9E-02
				THALLIUM	3.3E+02	MG/KG	2.7E-05	mg/kg/day	NA	NA	NA	3.1E-04	mg/kg/day	8.0E-05	mg/kg/day	3.9E+00
				VANADIUM	5.4E+01	MG/KG	4.4E-06	mg/kg/day	NA	NA	NA	5.2E-05	mg/kg/day	1.0E-03	mg/kg/day	5.2E-02
			Exp. Route Total								2.6E-05					4.9E+00

TABLE 7.3.RME

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

REASONABLE MAXIMUM EXPOSURE

SWMU 6 - Mangrove Disposal Site

NASD, Vieques Island, Puerto Rico

Scenario Timeframe: Current/Future
Receptor Population: Recreational
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Sediment	Sediment	Kiani Lagoon	Dermal													
				BENZO(a)PYRENE	8.0E-02	MG/KG	6.1E-10	mg/kg/day	7.3E+00	1/(mg/kg-day)	4.4E-09	7.1E-09	mg/kg/day	NA	NA	NA
				ALUMINUM	1.3E+04	MG/KG	7.6E-05	mg/kg/day	NA	NA	NA	8.8E-04	mg/kg/day	1.0E+00	mg/kg/day	8.8E-04
				ANTIMONY	3.8E+01	MG/KG	2.2E-07	mg/kg/day	NA	NA	NA	2.6E-06	mg/kg/day	6.0E-05	mg/kg/day	4.3E-02
				ARSENIC	2.1E+02	MG/KG	3.8E-06	mg/kg/day	1.5E+00	1/(mg/kg-day)	5.7E-06	4.4E-05	mg/kg/day	3.0E-04	mg/kg/day	1.5E-01
				BARIUM	2.2E+02	MG/KG	1.3E-06	mg/kg/day	NA	NA	NA	1.5E-05	mg/kg/day	4.9E-03	mg/kg/day	3.1E-03
				CADMIUM	5.3E+00	MG/KG	3.1E-08	mg/kg/day	NA	NA	NA	3.6E-07	mg/kg/day	2.5E-05	mg/kg/day	1.4E-02
				CHROMIUM, TOTAL	2.2E+01	MG/KG	1.3E-07	mg/kg/day	NA	NA	NA	1.5E-06	mg/kg/day	7.5E-05	mg/kg/day	2.0E-02
				IRON	2.2E+04	MG/KG	1.3E-04	mg/kg/day	NA	NA	NA	1.5E-03	mg/kg/day	3.0E-01	mg/kg/day	4.9E-03
				LEAD	9.9E+01	MG/KG	5.8E-07	mg/kg/day	NA	NA	NA	6.7E-06	mg/kg/day	NA	NA	NA
				MANGANESE	2.7E+02	MG/KG	1.6E-06	mg/kg/day	NA	NA	NA	1.9E-05	mg/kg/day	5.6E-03	mg/kg/day	3.3E-03
				SELENIUM	2.1E+02	MG/KG	1.2E-06	mg/kg/day	NA	NA	NA	1.4E-05	mg/kg/day	5.0E-03	mg/kg/day	2.8E-03
				THALLIUM	3.3E+02	MG/KG	1.9E-06	mg/kg/day	NA	NA	NA	2.3E-05	mg/kg/day	8.0E-05	mg/kg/day	2.8E-01
				VANADIUM	5.4E+01	MG/KG	3.2E-07	mg/kg/day	NA	NA	NA	3.7E-06	mg/kg/day	2.6E-05	mg/kg/day	1.4E-01
			Exp. Route Total								5.7E-06					6.6E-01
		Exposure Point Total									3.2E-05					5.5E+00
	Exposure Medium Total										3.2E-05					5.5E+00
Sediment Total											3.2E-05					5.5E+00
Surface Water	Surface Water	Kiani Lagoon	Ingestion													
				ARSENIC	5.3E+00	UG/L	2.8E-07	mg/kg/day	1.5E+00	1/(mg/kg-day)	4.2E-07	3.3E-06	mg/kg/day	3.0E-04	mg/kg/day	1.1E-02
				IRON	1.0E+03	UG/L	5.4E-05	mg/kg/day	NA	NA	NA	6.2E-04	mg/kg/day	3.0E-01	mg/kg/day	2.1E-03
				MERCURY	1.5E+00	UG/L	7.7E-08	mg/kg/day	NA	NA	NA	9.0E-07	mg/kg/day	3.0E-04	mg/kg/day	3.0E-03
				THALLIUM	4.9E+00	UG/L	2.6E-07	mg/kg/day	NA	NA	NA	3.0E-06	mg/kg/day	8.0E-05	mg/kg/day	3.8E-02
			Exp. Route Total								4.2E-07					5.4E-02
			Dermal													
				ARSENIC	5.3E+00	UG/L	2.2E-08	mg/kg/day	1.5E+00	1/(mg/kg-day)	3.4E-08	2.6E-07	mg/kg/day	3.0E-04	mg/kg/day	8.7E-04
				IRON	1.0E+03	UG/L	4.3E-06	mg/kg/day	NA	NA	NA	5.0E-05	mg/kg/day	3.0E-01	mg/kg/day	1.7E-04
				MERCURY	1.5E+00	UG/L	6.1E-09	mg/kg/day	NA	NA	NA	7.2E-08	mg/kg/day	2.1E-05	mg/kg/day	3.4E-03
				THALLIUM	4.9E+00	UG/L	2.1E-08	mg/kg/day	NA	NA	NA	2.4E-07	mg/kg/day	8.0E-05	mg/kg/day	3.0E-03
			Exp. Route Total								3.4E-08					7.5E-03
		Exposure Point Total									4.5E-07					6.1E-02
Surface Water Total											4.5E-07					6.1E-02
										Total of Receptor Risks Across All Media	3.8E-05			Total of Receptor Hazards Across All Media		6.6E+00

NA = Not applicable.

TABLE 7.4.RME

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

REASONABLE MAXIMUM EXPOSURE

SWMU 6 - Mangrove Disposal Site

NASD, Vieques Island, Puerto Rico

Scenario Timeframe: Future
Receptor Population: Residential
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Surface Soil	Surface Soil	SWMU 6 Surface Soil	Ingestion													
				BENZO(a)ANTHRACENE	6.3E-01	MG/KG	2.9E-07	mg/kg/day	7.3E-01	1/(mg/kg-day)	2.1E-07	8.6E-07	mg/kg/day	NA	NA	NA
				BENZO(a)PYRENE	5.9E-01	MG/KG	2.8E-07	mg/kg/day	7.3E+00	1/(mg/kg-day)	2.0E-06	8.1E-07	mg/kg/day	NA	NA	NA
				BENZO(b)FLUORANTHENE	6.2E-01	MG/KG	2.9E-07	mg/kg/day	7.3E-01	1/(mg/kg-day)	2.1E-07	8.4E-07	mg/kg/day	NA	NA	NA
				DIBENZ(a,h)ANTHRACENE	3.1E-01	MG/KG	1.5E-07	mg/kg/day	7.3E+00	1/(mg/kg-day)	1.1E-06	4.3E-07	mg/kg/day	NA	NA	NA
				INDENO(1,2,3-c,d)PYRENE	4.8E-01	MG/KG	2.3E-07	mg/kg/day	7.3E-01	1/(mg/kg-day)	1.6E-07	6.6E-07	mg/kg/day	NA	NA	NA
				ALUMINUM	8.5E+03	MG/KG	4.0E-03	mg/kg/day	NA	NA	NA	1.2E-02	mg/kg/day	1.0E+00	mg/kg/day	1.2E-02
				ANTIMONY	2.3E+00	MG/KG	1.1E-06	mg/kg/day	NA	NA	NA	3.1E-06	mg/kg/day	4.0E-04	mg/kg/day	7.7E-03
				ARSENIC	3.5E+00	MG/KG	1.6E-06	mg/kg/day	1.5E+00	1/(mg/kg-day)	2.5E-06	4.8E-06	mg/kg/day	3.0E-04	mg/kg/day	1.6E-02
				CHROMIUM, TOTAL	1.9E+01	MG/KG	8.7E-06	mg/kg/day	NA	NA	NA	2.5E-05	mg/kg/day	3.0E-03	mg/kg/day	8.5E-03
				IRON	2.8E+04	MG/KG	1.3E-02	mg/kg/day	NA	NA	NA	3.8E-02	mg/kg/day	3.0E-01	mg/kg/day	1.3E-01
				LEAD	2.8E+02	MG/KG	1.3E-04	mg/kg/day	NA	NA	NA	3.9E-04	mg/kg/day	NA	NA	NA
				MANGANESE	3.4E+02	MG/KG	1.6E-04	mg/kg/day	NA	NA	NA	4.7E-04	mg/kg/day	1.4E-01	mg/kg/day	3.4E-03
				THALLIUM	1.2E+00	MG/KG	5.4E-07	mg/kg/day	NA	NA	NA	1.6E-06	mg/kg/day	8.0E-05	mg/kg/day	2.0E-02
				VANADIUM	4.5E+01	MG/KG	2.1E-05	mg/kg/day	NA	NA	NA	6.2E-05	mg/kg/day	1.0E-03	mg/kg/day	6.2E-02
			Exp. Route Total								6.2E-06					2.6E-01
			Dermal													
				BENZO(a)ANTHRACENE	6.3E-01	MG/KG	1.5E-07	mg/kg/day	7.3E-01	1/(mg/kg-day)	1.1E-07	4.4E-07	mg/kg/day	NA	NA	NA
				BENZO(a)PYRENE	5.9E-01	MG/KG	1.4E-07	mg/kg/day	7.3E+00	1/(mg/kg-day)	1.0E-06	4.2E-07	mg/kg/day	NA	NA	NA
				BENZO(b)FLUORANTHENE	6.2E-01	MG/KG	1.5E-07	mg/kg/day	7.3E-01	1/(mg/kg-day)	1.1E-07	4.4E-07	mg/kg/day	NA	NA	NA
				DIBENZ(a,h)ANTHRACENE	3.1E-01	MG/KG	7.6E-08	mg/kg/day	7.3E+00	1/(mg/kg-day)	5.6E-07	2.2E-07	mg/kg/day	NA	NA	NA
				INDENO(1,2,3-c,d)PYRENE	4.8E-01	MG/KG	1.2E-07	mg/kg/day	7.3E-01	1/(mg/kg-day)	8.6E-08	3.4E-07	mg/kg/day	NA	NA	NA
				ALUMINUM	8.5E+03	MG/KG	1.6E-04	mg/kg/day	NA	NA	NA	4.7E-04	mg/kg/day	1.0E+00	mg/kg/day	4.7E-04
				ANTIMONY	2.3E+00	MG/KG	4.2E-08	mg/kg/day	NA	NA	NA	1.2E-07	mg/kg/day	6.0E-05	mg/kg/day	2.1E-03
				ARSENIC	3.5E+00	MG/KG	2.0E-07	mg/kg/day	1.5E+00	1/(mg/kg-day)	3.0E-07	5.8E-07	mg/kg/day	3.0E-04	mg/kg/day	1.9E-03
				CHROMIUM, TOTAL	1.9E+01	MG/KG	3.5E-07	mg/kg/day	NA	NA	NA	1.0E-06	mg/kg/day	7.5E-05	mg/kg/day	1.4E-02
				IRON	2.8E+04	MG/KG	5.2E-04	mg/kg/day	NA	NA	NA	1.5E-03	mg/kg/day	3.0E-01	mg/kg/day	5.1E-03
				LEAD	2.8E+02	MG/KG	5.3E-06	mg/kg/day	NA	NA	NA	1.5E-05	mg/kg/day	NA	NA	NA
				MANGANESE	3.4E+02	MG/KG	6.4E-06	mg/kg/day	NA	NA	NA	1.9E-05	mg/kg/day	5.6E-03	mg/kg/day	3.4E-03
				THALLIUM	1.2E+00	MG/KG	2.2E-08	mg/kg/day	NA	NA	NA	6.3E-08	mg/kg/day	8.0E-05	mg/kg/day	7.9E-04
				VANADIUM	4.5E+01	MG/KG	8.5E-07	mg/kg/day	NA	NA	NA	2.5E-06	mg/kg/day	2.6E-05	mg/kg/day	9.5E-02
			Exp. Route Total								2.2E-06					1.2E-01

TABLE 7.4.RME

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

REASONABLE MAXIMUM EXPOSURE

SWMU 6 - Mangrove Disposal Site

NASD, Vieques Island, Puerto Rico

Scenario Timeframe: Future
Receptor Population: Residential
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Surface Soil	Surface Soil	SWMU 6 Surface Soil	Inhalation	BENZO(a)ANTHRACENE	6.3E-01	MG/KG	4.3E-11	mg/kg/day	NA	NA	NA	1.3E-10	mg/kg/day	NA	NA	NA
				BENZO(a)PYRENE	5.9E-01	MG/KG	4.1E-11	mg/kg/day	3.1E+00	1/(mg/kg-day)	1.3E-10	1.2E-10	mg/kg/day	NA	NA	NA
				BENZO(b)FLUORANTHENE	6.2E-01	MG/KG	4.3E-11	mg/kg/day	NA	NA	NA	1.2E-10	mg/kg/day	NA	NA	NA
				DIBENZ(a,h)ANTHRACENE	3.1E-01	MG/KG	2.2E-11	mg/kg/day	NA	NA	NA	6.3E-11	mg/kg/day	NA	NA	NA
				INDENO(1,2,3-c,d)PYRENE	4.8E-01	MG/KG	3.3E-11	mg/kg/day	NA	NA	NA	9.7E-11	mg/kg/day	NA	NA	NA
				ALUMINUM	8.5E+03	MG/KG	5.9E-07	mg/kg/day	NA	NA	NA	1.7E-06	mg/kg/day	1.4E-03	mg/kg/day	1.2E-03
				ANTIMONY	2.3E+00	MG/KG	1.6E-10	mg/kg/day	NA	NA	NA	4.6E-10	mg/kg/day	NA	NA	NA
				ARSENIC	3.5E+00	MG/KG	2.4E-10	mg/kg/day	1.5E+01	1/(mg/kg-day)	3.7E-09	7.1E-10	mg/kg/day	NA	NA	NA
				CHROMIUM, TOTAL	1.9E+01	MG/KG	1.3E-09	mg/kg/day	4.2E+01	1/(mg/kg-day)	5.4E-08	3.7E-09	mg/kg/day	1.4E-02	mg/kg/day	2.6E-07
				IRON	2.8E+04	MG/KG	1.9E-06	mg/kg/day	NA	NA	NA	5.6E-06	mg/kg/day	NA	NA	NA
				LEAD	2.8E+02	MG/KG	1.9E-08	mg/kg/day	NA	NA	NA	5.7E-08	mg/kg/day	NA	NA	NA
				MANGANESE	3.4E+02	MG/KG	2.4E-08	mg/kg/day	NA	NA	NA	6.9E-08	mg/kg/day	1.4E-05	mg/kg/day	4.8E-03
				THALLIUM	1.2E+00	MG/KG	8.0E-11	mg/kg/day	NA	NA	NA	2.3E-10	mg/kg/day	NA	NA	NA
				VANADIUM	4.5E+01	MG/KG	3.1E-09	mg/kg/day	NA	NA	NA	9.1E-09	mg/kg/day	NA	NA	NA
			Exp. Route Total								5.8E-08					6.0E-03
		Exposure Point Total									8.4E-06					3.9E-01
	Exposure Medium Total										8.4E-06					3.9E-01
Surface Soil Total											8.4E-06					3.9E-01
Subsurface Soil	Subsurface Soil	SWMU 6 Subsurface Soil	Ingestion	ARSENIC	1.8E+00	MG/KG	8.2E-07	mg/kg/day	1.5E+00	1/(mg/kg-day)	1.2E-06	2.4E-06	mg/kg/day	3.0E-04	mg/kg/day	8.0E-03
			Exp. Route Total								1.2E-06					8.0E-03
			Dermal	ARSENIC	1.8E+00	MG/KG	9.8E-08	mg/kg/day	1.5E+00	1/(mg/kg-day)	1.5E-07	2.9E-07	mg/kg/day	3.0E-04	mg/kg/day	9.6E-04
			Exp. Route Total								1.5E-07					9.6E-04
			Inhalation	ARSENIC	1.8E+00	MG/KG	1.2E-10	mg/kg/day	1.5E+01	1/(mg/kg-day)	1.8E-09	3.5E-10	mg/kg/day	NA	NA	NA
			Exp. Route Total								1.8E-09					0.0E+00
		Exposure Point Total									1.4E-06					9.0E-03
	Exposure Medium Total										1.4E-06					9.0E-03
Subsurface Soil Total											1.4E-06					9.0E-03
Soil Total											9.8E-06					3.9E-01
Groundwater	Groundwater	Tap Water	Ingestion	CHLOROFORM	7.6E-01	UG/L	7.1E-06	mg/kg/day	NA	NA	NA	2.1E-05	mg/kg/day	1.0E-02	mg/kg/day	2.1E-03

TABLE 7.4.RME

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

REASONABLE MAXIMUM EXPOSURE

SWMU 6 - Mangrove Disposal Site

NASD, Vieques Island, Puerto Rico

Scenario Timeframe: Future
Receptor Population: Residential
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
				PCB-1221 (AROCLOR 1221)	5.0E-01	UG/L	4.7E-06	mg/kg/day	2.0E+00	1/(mg/kg-day)	9.3E-06	1.4E-05	mg/kg/day	NA	mg/kg/day	NA
				PCB-1232 (AROCLOR 1232)	9.0E-02	UG/L	8.5E-07	mg/kg/day	2.0E+00	1/(mg/kg-day)	1.7E-06	2.5E-06	mg/kg/day	NA	mg/kg/day	NA
				Perchlorate	1.3E+01	UG/L	1.2E-04	mg/kg/day	NA	NA	NA	3.5E-04	mg/kg/day	3.0E-05	mg/kg/day	1.2E+01
				ANTIMONY	1.0E+02	UG/L	9.8E-04	mg/kg/day	NA	NA	NA	2.8E-03	mg/kg/day	4.0E-04	mg/kg/day	7.1E+00
				ARSENIC	7.7E+01	UG/L	7.2E-04	mg/kg/day	1.5E+00	1/(mg/kg-day)	1.1E-03	2.1E-03	mg/kg/day	3.0E-04	mg/kg/day	7.0E+00
				BARIUM	4.8E+02	UG/L	4.5E-03	mg/kg/day	NA	NA	NA	1.3E-02	mg/kg/day	7.0E-02	mg/kg/day	1.9E-01
				CADMIUM	9.0E+00	UG/L	8.5E-05	mg/kg/day	NA	NA	NA	2.5E-04	mg/kg/day	5.0E-04	mg/kg/day	4.9E-01
				CHROMIUM, TOTAL	3.3E+01	UG/L	3.1E-04	mg/kg/day	NA	NA	NA	9.1E-04	mg/kg/day	3.0E-03	mg/kg/day	3.0E-01
				IRON	6.1E+03	UG/L	5.7E-02	mg/kg/day	NA	NA	NA	1.7E-01	mg/kg/day	3.0E-01	mg/kg/day	5.6E-01
				MANGANESE	8.8E+03	UG/L	8.3E-02	mg/kg/day	NA	NA	NA	2.4E-01	mg/kg/day	2.0E-02	mg/kg/day	1.2E+01
				SELENIUM	1.3E+02	UG/L	1.2E-03	mg/kg/day	NA	NA	NA	3.6E-03	mg/kg/day	5.0E-03	mg/kg/day	7.3E-01
				SILVER	5.6E+01	UG/L	5.3E-04	mg/kg/day	NA	NA	NA	1.5E-03	mg/kg/day	5.0E-03	mg/kg/day	3.1E-01
				THALLIUM	6.0E+01	UG/L	5.7E-04	mg/kg/day	NA	NA	NA	1.7E-03	mg/kg/day	8.0E-05	mg/kg/day	2.1E+01
			Exp. Route Total								1.1E-03					6.1E+01

TABLE 7.4.RME

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

REASONABLE MAXIMUM EXPOSURE

SWMU 6 - Mangrove Disposal Site

NASD, Vieques Island, Puerto Rico

Scenario Timeframe: Future
Receptor Population: Residential
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Groundwater	Groundwater	Tap Water	Dermal	CHLOROFORM	7.6E-01	UG/L	6.5E-13	mg/kg/day	NA	NA	NA	1.9E-12	mg/kg/day	1.0E-02	mg/kg/day	1.9E-10
				PCB-1221 (AROCLOR 1221)	5.0E-01	UG/L	6.4E-11	mg/kg/day	2.0E+00	1/(mg/kg-day)	1.3E-10	1.9E-10	mg/kg/day	NA	mg/kg/day	NA
				PCB-1232 (AROCLOR 1232)	9.0E-02	UG/L	4.0E-15	mg/kg/day	2.0E+00	1/(mg/kg-day)	8.1E-15	1.2E-14	mg/kg/day	NA	mg/kg/day	NA
				Perchlorate	1.3E+01	UG/L	6.3E-13	mg/kg/day	NA	NA	NA	1.8E-12	mg/kg/day	3.0E-05	mg/kg/day	6.1E-08
				ANTIMONY	1.0E+02	UG/L	5.1E-12	mg/kg/day	NA	NA	NA	1.5E-11	mg/kg/day	6.0E-05	mg/kg/day	2.5E-07
				ARSENIC	7.7E+01	UG/L	3.8E-12	mg/kg/day	1.5E+00	1/(mg/kg-day)	5.6E-12	1.1E-11	mg/kg/day	3.0E-04	mg/kg/day	3.7E-08
				BARIUM	4.8E+02	UG/L	2.3E-11	mg/kg/day	NA	NA	NA	6.8E-11	mg/kg/day	4.9E-03	mg/kg/day	1.4E-08
				CADMIUM	9.0E+00	UG/L	4.4E-13	mg/kg/day	NA	NA	NA	1.3E-12	mg/kg/day	1.3E-05	mg/kg/day	1.0E-07
				CHROMIUM, TOTAL	3.3E+01	UG/L	3.3E-12	mg/kg/day	NA	NA	NA	9.5E-12	mg/kg/day	7.5E-05	mg/kg/day	1.3E-07
				IRON	6.1E+03	UG/L	3.0E-10	mg/kg/day	NA	NA	NA	8.7E-10	mg/kg/day	3.0E-01	mg/kg/day	2.9E-09
				MANGANESE	8.8E+03	UG/L	4.3E-10	mg/kg/day	NA	NA	NA	1.3E-09	mg/kg/day	5.6E-03	mg/kg/day	2.3E-07
				SELENIUM	1.3E+02	UG/L	6.5E-12	mg/kg/day	NA	NA	NA	1.9E-11	mg/kg/day	5.0E-03	mg/kg/day	3.8E-09
				SILVER	5.6E+01	UG/L	1.7E-12	mg/kg/day	NA	NA	NA	4.8E-12	mg/kg/day	2.0E-04	mg/kg/day	2.4E-08
				THALLIUM	6.0E+01	UG/L	3.0E-12	mg/kg/day	NA	NA	NA	8.6E-12	mg/kg/day	8.0E-05	mg/kg/day	1.1E-07
			Exp. Route Total								1.3E-10					9.5E-07
		Exposure Point Total									1.1E-03					6.1E+01
Groundwater Total											1.1E-03					6.1E+01
											Total of Receptor Risks Across All Media					Total of Receptor Hazards Across All Media
											1.1E-03					6.2E+01

NA = Not applicable.

Table 7.4.RME Supplement
Calculation of DAevent
Residential Adult, Groundwater
SWMU 6 - Mangrove Disposal Site
NASD, Vieques Island, Puerto Rico

Chemical of Potential Concern	Groundwater Concentration (CW) (ug/L)	Permeability Coefficient (Kp) (cm/hr)	B (dimensionless)	Lag Time (τ_{event}) (hr)	t* (hr)	Fraction Absorbed Water (FA) (dimensionless)	Duration of Event (tevent) (hr)	DAevent (mg/cm^2-event)	Eq
CHLOROFORM	7.6E-01	6.8E-03	0.0E+00	5.0E-01	1.2E+00	1.0E+00	0.58	7.7E-09	2
PCB-1221 (AROCLOR 1221)	5.0E-01	4.3E-01	3.2E+00	1.1E+01	4.8E+01	5.0E-01	0.58	7.6E-07	2
PCB-1232 (AROCLOR 1232)	9.0E-02	1.5E-04	3.2E+00	1.1E+01	4.8E+01	5.0E-01	0.58	4.8E-11	2
Perchlorate	1.3E+01	1.0E-03	NA	NA	NA	NA	0.58	7.4E-09	1
ANTIMONY	1.0E+02	1.0E-03	NA	NA	NA	NA	0.58	6.0E-08	1
ARSENIC	7.7E+01	1.0E-03	NA	NA	NA	NA	0.58	4.5E-08	1
BARIUM	4.8E+02	1.0E-03	NA	NA	NA	NA	0.58	2.8E-07	1
CADMIUM	9.0E+00	1.0E-03	NA	NA	NA	NA	0.58	5.2E-09	1
CHROMIUM, TOTAL	3.3E+01	2.0E-03	NA	NA	NA	NA	0.58	3.9E-08	1
IRON	6.1E+03	1.0E-03	NA	NA	NA	NA	0.58	3.5E-06	1
MANGANESE	8.8E+03	1.0E-03	NA	NA	NA	NA	0.58	5.1E-06	1
SELENIUM	1.3E+02	1.0E-03	NA	NA	NA	NA	0.58	7.7E-08	1
SILVER	5.6E+01	6.0E-04	NA	NA	NA	NA	0.58	2.0E-08	1
THALLIUM	6.0E+01	1.0E-03	NA	NA	NA	NA	0.58	3.5E-08	1

Inorganics: DAevent (mg/cm2-event) =

Kp x CW x tevent x 0.001 mg/ug x 0.001 l/cm^3 (eq 1)

Organics: DAevent (mg/cm2-event) =

$$\text{If } t_{event} \le t^*, \text{then } DA_{event} = 2 \times FA \times K_p \times C_w \sqrt{\frac{6 \times \tau_{event} \times t_{event}}{\pi}} \qquad \text{(eq 2)}$$

$$\text{If } t_{event} \ge t^*, \text{then } DA_{event} = FA \times K_p \times C_w \left[\frac{t_{event}}{1+B} + 2 \times \tau_{event} \left(\frac{1+3B+3B^2}{(1+B)^2} \right) \right] \qquad \text{(eq 3)}$$

Notes:

Permeability constants from EPA 2001, *Risk Assessment Guidance for Superfund Volume I: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment - Interim).* EPA/540/R/99/005. The default value of 0.001 was assigned to inorganics not listed in this document.

NA - not applicable.

TABLE 7.5.RME

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

REASONABLE MAXIMUM EXPOSURE

SWMU 6 - Mangrove Disposal Site

NASD, Vieques Island, Puerto Rico

Scenario Timeframe: Future
Receptor Population: Residential
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Surface Soil	Surface Soil	SWMU 6 Surface Soil	Ingestion													
				BENZO(a)ANTHRACENE	6.3E-01	MG/KG	6.9E-07	mg/kg/day	7.3E-01	1/(mg/kg-day)	5.0E-07	8.0E-06	mg/kg/day	NA	NA	NA
				BENZO(a)PYRENE	5.9E-01	MG/KG	6.5E-07	mg/kg/day	7.3E+00	1/(mg/kg-day)	4.7E-06	7.5E-06	mg/kg/day	NA	NA	NA
				BENZO(b)FLUORANTHENE	6.2E-01	MG/KG	6.7E-07	mg/kg/day	7.3E-01	1/(mg/kg-day)	4.9E-07	7.9E-06	mg/kg/day	NA	NA	NA
				DIBENZ(a,h)ANTHRACENE	3.1E-01	MG/KG	3.4E-07	mg/kg/day	7.3E+00	1/(mg/kg-day)	2.5E-06	4.0E-06	mg/kg/day	NA	NA	NA
				INDENO(1,2,3-c,d)PYRENE	4.8E-01	MG/KG	5.3E-07	mg/kg/day	7.3E-01	1/(mg/kg-day)	3.8E-07	6.1E-06	mg/kg/day	NA	NA	NA
				ALUMINUM	8.5E+03	MG/KG	9.3E-03	mg/kg/day	NA	NA	NA	1.1E-01	mg/kg/day	1.0E+00	mg/kg/day	1.1E-01
				ANTIMONY	2.3E+00	MG/KG	2.5E-06	mg/kg/day	NA	NA	NA	2.9E-05	mg/kg/day	4.0E-04	mg/kg/day	7.2E-02
				ARSENIC	3.5E+00	MG/KG	3.8E-06	mg/kg/day	1.5E+00	1/(mg/kg-day)	5.8E-06	4.5E-05	mg/kg/day	3.0E-04	mg/kg/day	1.5E-01
				CHROMIUM, TOTAL	1.9E+01	MG/KG	2.0E-05	mg/kg/day	NA	NA	NA	2.4E-04	mg/kg/day	3.0E-03	mg/kg/day	7.9E-02
				IRON	2.8E+04	MG/KG	3.1E-02	mg/kg/day	NA	NA	NA	3.6E-01	mg/kg/day	3.0E-01	mg/kg/day	1.2E+00
				LEAD	2.8E+02	MG/KG	3.1E-04	mg/kg/day	NA	NA	NA	3.6E-03	mg/kg/day	NA	NA	NA
				MANGANESE	3.4E+02	MG/KG	3.8E-04	mg/kg/day	NA	NA	NA	4.4E-03	mg/kg/day	1.4E-01	mg/kg/day	3.1E-02
				THALLIUM	1.2E+00	MG/KG	1.3E-06	mg/kg/day	NA	NA	NA	1.5E-05	mg/kg/day	8.0E-05	mg/kg/day	1.8E-01
				VANADIUM	4.5E+01	MG/KG	5.0E-05	mg/kg/day	NA	NA	NA	5.8E-04	mg/kg/day	1.0E-03	mg/kg/day	5.8E-01
			Exp. Route Total								1.4E-05					2.4E+00
			Dermal													
				BENZO(a)ANTHRACENE	6.3E-01	MG/KG	2.5E-07	mg/kg/day	7.3E-01	1/(mg/kg-day)	1.8E-07	2.9E-06	mg/kg/day	NA	NA	NA
				BENZO(a)PYRENE	5.9E-01	MG/KG	2.4E-07	mg/kg/day	7.3E+00	1/(mg/kg-day)	1.7E-06	2.7E-06	mg/kg/day	NA	NA	NA
				BENZO(b)FLUORANTHENE	6.2E-01	MG/KG	2.5E-07	mg/kg/day	7.3E-01	1/(mg/kg-day)	1.8E-07	2.9E-06	mg/kg/day	NA	NA	NA
				DIBENZ(a,h)ANTHRACENE	3.1E-01	MG/KG	1.3E-07	mg/kg/day	7.3E+00	1/(mg/kg-day)	9.1E-07	1.5E-06	mg/kg/day	NA	NA	NA
				INDENO(1,2,3-c,d)PYRENE	4.8E-01	MG/KG	1.9E-07	mg/kg/day	7.3E-01	1/(mg/kg-day)	1.4E-07	2.2E-06	mg/kg/day	NA	NA	NA
				ALUMINUM	8.5E+03	MG/KG	2.6E-04	mg/kg/day	NA	NA	NA	3.1E-03	mg/kg/day	1.0E+00	mg/kg/day	3.1E-03
				ANTIMONY	2.3E+00	MG/KG	6.9E-08	mg/kg/day	NA	NA	NA	8.1E-07	mg/kg/day	6.0E-05	mg/kg/day	1.4E-02
				ARSENIC	3.5E+00	MG/KG	3.2E-07	mg/kg/day	1.5E+00	1/(mg/kg-day)	4.8E-07	3.8E-06	mg/kg/day	3.0E-04	mg/kg/day	1.3E-02
				CHROMIUM, TOTAL	1.9E+01	MG/KG	5.7E-07	mg/kg/day	NA	NA	NA	6.6E-06	mg/kg/day	7.5E-05	mg/kg/day	8.9E-02
				IRON	2.8E+04	MG/KG	8.6E-04	mg/kg/day	NA	NA	NA	1.0E-02	mg/kg/day	3.0E-01	mg/kg/day	3.3E-02
				LEAD	2.8E+02	MG/KG	8.6E-06	mg/kg/day	NA	NA	NA	1.0E-04	mg/kg/day	NA	NA	NA
				MANGANESE	3.4E+02	MG/KG	1.1E-05	mg/kg/day	NA	NA	NA	1.2E-04	mg/kg/day	5.6E-03	mg/kg/day	2.2E-02
				THALLIUM	1.2E+00	MG/KG	3.5E-08	mg/kg/day	NA	NA	NA	4.1E-07	mg/kg/day	8.0E-05	mg/kg/day	5.2E-03
				VANADIUM	4.5E+01	MG/KG	1.4E-06	mg/kg/day	NA	NA	NA	1.6E-05	mg/kg/day	2.6E-05	mg/kg/day	6.2E-01
			Exp. Route Total								3.6E-06					8.0E-01

TABLE 7.5.RME

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

REASONABLE MAXIMUM EXPOSURE

SWMU 6 - Mangrove Disposal Site

NASD, Vieques Island, Puerto Rico

Scenario Timeframe: Future
Receptor Population: Residential
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Surface Soil	Surface Soil	SWMU 6 Surface Soil	Inhalation	BENZO(a)ANTHRACENE	6.3E-01	MG/KG	4.4E-10	mg/kg/day	NA	NA	NA	4.4E-10	mg/kg/day	NA	NA	NA
				BENZO(a)PYRENE	5.9E-01	MG/KG	4.2E-10	mg/kg/day	3.1E+00	1/(mg/kg-day)	1.3E-09	4.2E-10	mg/kg/day	NA	NA	NA
				BENZO(b)FLUORANTHENE	6.2E-01	MG/KG	4.3E-10	mg/kg/day	NA	NA	NA	4.3E-10	mg/kg/day	NA	NA	NA
				DIBENZ(a,h)ANTHRACENE	3.1E-01	MG/KG	2.2E-10	mg/kg/day	NA	NA	NA	2.2E-10	mg/kg/day	NA	NA	NA
				INDENO(1,2,3-c,d)PYRENE	4.8E-01	MG/KG	3.4E-10	mg/kg/day	NA	NA	NA	3.4E-10	mg/kg/day	NA	NA	NA
				ALUMINUM	8.5E+03	MG/KG	6.0E-06	mg/kg/day	NA	NA	NA	6.0E-06	mg/kg/day	1.4E-03	mg/kg/day	4.2E-03
				ANTIMONY	2.3E+00	MG/KG	1.6E-09	mg/kg/day	NA	NA	NA	1.6E-09	mg/kg/day	NA	NA	NA
				ARSENIC	3.5E+00	MG/KG	2.5E-09	mg/kg/day	1.5E+01	1/(mg/kg-day)	3.7E-08	2.5E-09	mg/kg/day	NA	NA	NA
				CHROMIUM, TOTAL	1.9E+01	MG/KG	1.3E-08	mg/kg/day	4.2E+01	1/(mg/kg-day)	5.5E-07	1.3E-08	mg/kg/day	1.4E-02	mg/kg/day	9.2E-07
				IRON	2.8E+04	MG/KG	2.0E-05	mg/kg/day	NA	NA	NA	2.0E-05	mg/kg/day	NA	NA	NA
				LEAD	2.8E+02	MG/KG	2.0E-07	mg/kg/day	NA	NA	NA	2.0E-07	mg/kg/day	NA	NA	NA
				MANGANESE	3.4E+02	MG/KG	2.4E-07	mg/kg/day	NA	NA	NA	2.4E-07	mg/kg/day	1.4E-05	mg/kg/day	1.7E-02
				THALLIUM	1.2E+00	MG/KG	8.1E-10	mg/kg/day	NA	NA	NA	8.1E-10	mg/kg/day	NA	NA	NA
				VANADIUM	4.5E+01	MG/KG	3.2E-08	mg/kg/day	NA	NA	NA	3.2E-08	mg/kg/day	NA	NA	NA
			Exp. Route Total								5.9E-07					2.1E-02
		Exposure Point Total									1.9E-05					3.2E+00
	Exposure Medium Total										1.9E-05					3.2E+00
Surface Soil Total											1.9E-05					3.2E+00
Subsurface Soil	Subsurface Soil	SWMU 6 Subsurface Soil	Ingestion	ARSENIC	1.8E+00	MG/KG	1.9E-06	mg/kg/day	1.5E+00	1/(mg/kg-day)	2.9E-06	2.2E-05	mg/kg/day	3.0E-04	mg/kg/day	7.5E-02
			Exp. Route Total								2.9E-06					7.5E-02
			Dermal	ARSENIC	1.8E+00	MG/KG	1.6E-07	mg/kg/day	1.5E+00	1/(mg/kg-day)	2.4E-07	1.9E-06	mg/kg/day	3.0E-04	mg/kg/day	6.3E-03
			Exp. Route Total								2.4E-07					6.3E-03
			Inhalation	ARSENIC	1.8E+00	MG/KG	1.2E-09	mg/kg/day	1.5E+01	1/(mg/kg-day)	1.9E-08	1.2E-09	mg/kg/day	NA	NA	NA
			Exp. Route Total								1.9E-08					0.0E+00
		Exposure Point Total									3.1E-06					8.1E-02
	Exposure Medium Total										3.1E-06					8.1E-02
Subsurface Soil Total											3.1E-06					8.1E-02
Soil Total											2.2E-05					3.3E+00
Groundwater	Groundwater	Tap Water	Ingestion	CHLOROFORM	7.6E-01	UG/L	4.1E-06	mg/kg/day	NA	NA	NA	4.8E-05	mg/kg/day	1.0E-02	mg/kg/day	4.8E-03

TABLE 7.5.RME

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

REASONABLE MAXIMUM EXPOSURE

SWMU 6 - Mangrove Disposal Site

NASD, Vieques Island, Puerto Rico

Scenario Timeframe: Future
Receptor Population: Residential
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
				PCB-1221 (AROCLOR 1221)	5.0E-01	UG/L	2.7E-06	mg/kg/day	2.0E+00	1/(mg/kg-day)	5.5E-06	3.2E-05	mg/kg/day	NA	mg/kg/day	NA
				PCB-1232 (AROCLOR 1232)	9.0E-02	UG/L	4.9E-07	mg/kg/day	2.0E+00	1/(mg/kg-day)	9.9E-07	5.8E-06	mg/kg/day	NA	mg/kg/day	NA
				Perchlorate	1.3E+01	UG/L	7.0E-05	mg/kg/day	NA	NA	NA	8.2E-04	mg/kg/day	3.0E-05	mg/kg/day	2.7E+01
				ANTIMONY	1.0E+02	UG/L	5.7E-04	mg/kg/day	NA	NA	NA	6.6E-03	mg/kg/day	4.0E-04	mg/kg/day	1.7E+01
				ARSENIC	7.7E+01	UG/L	4.2E-04	mg/kg/day	1.5E+00	1/(mg/kg-day)	6.3E-04	4.9E-03	mg/kg/day	3.0E-04	mg/kg/day	1.6E+01
				BARIUM	4.8E+02	UG/L	2.6E-03	mg/kg/day	NA	NA	NA	3.0E-02	mg/kg/day	7.0E-02	mg/kg/day	4.3E-01
				CADMIUM	9.0E+00	UG/L	4.9E-05	mg/kg/day	NA	NA	NA	5.8E-04	mg/kg/day	5.0E-04	mg/kg/day	1.2E+00
				CHROMIUM, TOTAL	3.3E+01	UG/L	1.8E-04	mg/kg/day	NA	NA	NA	2.1E-03	mg/kg/day	3.0E-03	mg/kg/day	7.1E-01
				IRON	6.1E+03	UG/L	3.3E-02	mg/kg/day	NA	NA	NA	3.9E-01	mg/kg/day	3.0E-01	mg/kg/day	1.3E+00
				MANGANESE	8.8E+03	UG/L	4.8E-02	mg/kg/day	NA	NA	NA	5.6E-01	mg/kg/day	2.0E-02	mg/kg/day	2.8E+01
				SELENIUM	1.3E+02	UG/L	7.3E-04	mg/kg/day	NA	NA	NA	8.5E-03	mg/kg/day	5.0E-03	mg/kg/day	1.7E+00
				SILVER	5.6E+01	UG/L	3.1E-04	mg/kg/day	NA	NA	NA	3.6E-03	mg/kg/day	5.0E-03	mg/kg/day	7.2E-01
				THALLIUM	6.0E+01	UG/L	3.3E-04	mg/kg/day	NA	NA	NA	3.9E-03	mg/kg/day	8.0E-05	mg/kg/day	4.8E+01
			Exp. Route Total								6.4E-04					1.4E+02

TABLE 7.5.RME

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

REASONABLE MAXIMUM EXPOSURE

SWMU 6 - Mangrove Disposal Site

NASD, Vieques Island, Puerto Rico

Scenario Timeframe: Future
Receptor Population: Residential
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Groundwater	Groundwater	Tap Water	Dermal	CHLOROFORM	7.6E-01	UG/L	3.6E-13	mg/kg/day	NA	NA	NA	4.2E-12	mg/kg/day	1.0E-02	mg/kg/day	4.2E-10
				PCB-1221 (AROCLOR 1221)	5.0E-01	UG/L	3.6E-11	mg/kg/day	2.0E+00	1/(mg/kg-day)	7.2E-11	4.2E-10	mg/kg/day	NA	mg/kg/day	NA
				PCB-1232 (AROCLOR 1232)	9.0E-02	UG/L	2.3E-15	mg/kg/day	2.0E+00	1/(mg/kg-day)	4.5E-15	2.6E-14	mg/kg/day	NA	mg/kg/day	NA
				Perchlorate	1.3E+01	UG/L	4.6E-13	mg/kg/day	NA	NA	NA	5.4E-12	mg/kg/day	3.0E-05	mg/kg/day	1.8E-07
				ANTIMONY	1.0E+02	UG/L	3.8E-12	mg/kg/day	NA	NA	NA	4.4E-11	mg/kg/day	6.0E-05	mg/kg/day	7.3E-07
				ARSENIC	7.7E+01	UG/L	2.8E-12	mg/kg/day	1.5E+00	1/(mg/kg-day)	4.2E-12	3.2E-11	mg/kg/day	3.0E-04	mg/kg/day	1.1E-07
				BARIUM	4.8E+02	UG/L	1.7E-11	mg/kg/day	NA	NA	NA	2.0E-10	mg/kg/day	4.9E-03	mg/kg/day	4.1E-08
				CADMIUM	9.0E+00	UG/L	3.3E-13	mg/kg/day	NA	NA	NA	3.8E-12	mg/kg/day	1.3E-05	mg/kg/day	3.0E-07
				CHROMIUM, TOTAL	3.3E+01	UG/L	2.4E-12	mg/kg/day	NA	NA	NA	2.8E-11	mg/kg/day	7.5E-05	mg/kg/day	3.7E-07
				IRON	6.1E+03	UG/L	2.2E-10	mg/kg/day	NA	NA	NA	2.6E-09	mg/kg/day	3.0E-01	mg/kg/day	8.6E-09
				MANGANESE	8.8E+03	UG/L	3.2E-10	mg/kg/day	NA	NA	NA	3.7E-09	mg/kg/day	5.6E-03	mg/kg/day	6.6E-07
				SELENIUM	1.3E+02	UG/L	4.8E-12	mg/kg/day	NA	NA	NA	5.6E-11	mg/kg/day	5.0E-03	mg/kg/day	1.1E-08
				SILVER	5.6E+01	UG/L	1.2E-12	mg/kg/day	NA	NA	NA	1.4E-11	mg/kg/day	2.0E-04	mg/kg/day	7.1E-08
				THALLIUM	6.0E+01	UG/L	2.2E-12	mg/kg/day	NA	NA	NA	2.5E-11	mg/kg/day	8.0E-05	mg/kg/day	3.2E-07
			Exp. Route Total								7.6E-11					2.8E-06
		Exposure Point Total									6.4E-04					1.4E+02
Groundwater Total											6.4E-04					1.4E+02
											Total of Receptor Risks Across All Media					6.6E-04					Total of Receptor Hazards Across All Media					1.5E+02

NA = Not applicable.

Table 7.5.RME Supplement
Calculation of DAevent
Residential Child, Groundwater
SWMU 6 - Mangrove Disposal Site
NASD, Vieques Island, Puerto Rico

Chemical of Potential Concern	Groundwater Concentration (CW) (ug/L)	Permeability Coefficient (Kp) (cm/hr)	B (dimensionless)	Lag Time (τ_{event}) (hr)	t* (hr)	Fraction Absorbed Water (FA) (dimensionless)	Duration of Event (tevent) (hr)	DAevent (mg/cm^2-event)	Eq
CHLOROFORM	7.6E-01	6.8E-03	0.0E+00	5.0E-01	1.2E+00	1.0E+00	1	1.0E-08	2
PCB-1221 (AROCLOR 1221)	5.0E-01	4.3E-01	3.2E+00	1.1E+01	4.8E+01	5.0E-01	1	9.9E-07	2
PCB-1232 (AROCLOR 1232)	9.0E-02	1.5E-04	3.2E+00	1.1E+01	4.8E+01	5.0E-01	1	6.3E-11	2
Perchlorate	1.3E+01	1.0E-03	NA	NA	NA	NA	1	1.3E-08	1
ANTIMONY	1.0E+02	1.0E-03	NA	NA	NA	NA	1	1.0E-07	1
ARSENIC	7.7E+01	1.0E-03	NA	NA	NA	NA	1	7.7E-08	1
BARIUM	4.8E+02	1.0E-03	NA	NA	NA	NA	1	4.8E-07	1
CADMIUM	9.0E+00	1.0E-03	NA	NA	NA	NA	1	9.0E-09	1
CHROMIUM, TOTAL	3.3E+01	2.0E-03	NA	NA	NA	NA	1	6.7E-08	1
IRON	6.1E+03	1.0E-03	NA	NA	NA	NA	1	6.1E-06	1
MANGANESE	8.8E+03	1.0E-03	NA	NA	NA	NA	1	8.8E-06	1
SELENIUM	1.3E+02	1.0E-03	NA	NA	NA	NA	1	1.3E-07	1
SILVER	5.6E+01	6.0E-04	NA	NA	NA	NA	1	3.4E-08	1
THALLIUM	6.0E+01	1.0E-03	NA	NA	NA	NA	1	6.0E-08	1

Inorganics: DAevent (mg/cm2-event) =

Kp x CW x tevent x 0.001 mg/ug x 0.001 l/cm^3 (eq 1)

Organics: DAevent (mg/cm2-event) =

$$\text{If } t_{event} \le t^*, \text{then } DA_{event} = 2 \times FA \times K_p \times C_w \sqrt{\frac{6 \times \tau_{event} \times t_{event}}{\pi}} \qquad \text{(eq 2)}$$

$$\text{If } t_{event} \ge t^*, \text{then } DA_{event} = FA \times K_p \times C_w \left[\frac{t_{event}}{1+B} + 2 \times \tau_{event} \left(\frac{1+3B+3B^2}{(1+B)^2} \right) \right] \qquad \text{(eq 3)}$$

Notes:

Permeability constants from EPA 2001, *Risk Assessment Guidance for Superfund Volume I: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment - Interim).* EPA/540/R/99/005. The default value of 0.001 was assigned to inorganics not listed in this document.

NA - not applicable.

TABLE 7.6.RME

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

REASONABLE MAXIMUM EXPOSURE

SWMU 6 - Mangrove Disposal Site

NASD, Vieques Island, Puerto Rico

Scenario Timeframe: Future
Receptor Population: Industrial Worker
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Surface Soil	Surface Soil	SWMU 6 Surface Soil	Ingestion													
				BENZO(a)ANTHRACENE	6.3E-01	MG/KG	2.2E-07	mg/kg/day	7.3E-01	1/(mg/kg-day)	1.6E-07	6.1E-07	mg/kg/day	NA	NA	NA
				BENZO(a)PYRENE	5.9E-01	MG/KG	2.1E-07	mg/kg/day	7.3E+00	1/(mg/kg-day)	1.5E-06	5.8E-07	mg/kg/day	NA	NA	NA
				BENZO(b)FLUORANTHENE	6.2E-01	MG/KG	2.2E-07	mg/kg/day	7.3E-01	1/(mg/kg-day)	1.6E-07	6.0E-07	mg/kg/day	NA	NA	NA
				DIBENZ(a,h)ANTHRACENE	3.1E-01	MG/KG	1.1E-07	mg/kg/day	7.3E+00	1/(mg/kg-day)	8.0E-07	3.1E-07	mg/kg/day	NA	NA	NA
				INDENO(1,2,3-c,d)PYRENE	4.8E-01	MG/KG	1.7E-07	mg/kg/day	7.3E-01	1/(mg/kg-day)	1.2E-07	4.7E-07	mg/kg/day	NA	NA	NA
				ALUMINUM	8.5E+03	MG/KG	3.0E-03	mg/kg/day	NA	NA	NA	8.3E-03	mg/kg/day	1.0E+00	mg/kg/day	8.3E-03
				ANTIMONY	2.3E+00	MG/KG	7.9E-07	mg/kg/day	NA	NA	NA	2.2E-06	mg/kg/day	4.0E-04	mg/kg/day	5.5E-03
				ARSENIC	3.5E+00	MG/KG	1.2E-06	mg/kg/day	1.5E+00	1/(mg/kg-day)	1.8E-06	3.4E-06	mg/kg/day	3.0E-04	mg/kg/day	1.1E-02
				CHROMIUM, TOTAL	1.9E+01	MG/KG	6.5E-06	mg/kg/day	NA	NA	NA	1.8E-05	mg/kg/day	3.0E-03	mg/kg/day	6.1E-03
				IRON	2.8E+04	MG/KG	9.8E-03	mg/kg/day	NA	NA	NA	2.7E-02	mg/kg/day	3.0E-01	mg/kg/day	9.1E-02
				LEAD	2.8E+02	MG/KG	9.8E-05	mg/kg/day	NA	NA	NA	2.8E-04	mg/kg/day	NA	NA	NA
				MANGANESE	3.4E+02	MG/KG	1.2E-04	mg/kg/day	NA	NA	NA	3.4E-04	mg/kg/day	1.4E-01	mg/kg/day	2.4E-03
				THALLIUM	1.2E+00	MG/KG	4.0E-07	mg/kg/day	NA	NA	NA	1.1E-06	mg/kg/day	8.0E-05	mg/kg/day	1.4E-02
				VANADIUM	4.5E+01	MG/KG	1.6E-05	mg/kg/day	NA	NA	NA	4.4E-05	mg/kg/day	1.0E-03	mg/kg/day	4.4E-02
			Exp. Route Total								4.6E-06					1.8E-01
			Dermal													
				BENZO(a)ANTHRACENE	6.3E-01	MG/KG	1.9E-07	mg/kg/day	7.3E-01	1/(mg/kg-day)	1.4E-07	5.3E-07	mg/kg/day	NA	NA	NA
				BENZO(a)PYRENE	5.9E-01	MG/KG	1.8E-07	mg/kg/day	7.3E+00	1/(mg/kg-day)	1.3E-06	4.9E-07	mg/kg/day	NA	NA	NA
				BENZO(b)FLUORANTHENE	6.2E-01	MG/KG	1.8E-07	mg/kg/day	7.3E-01	1/(mg/kg-day)	1.3E-07	5.2E-07	mg/kg/day	NA	NA	NA
				DIBENZ(a,h)ANTHRACENE	3.1E-01	MG/KG	9.4E-08	mg/kg/day	7.3E+00	1/(mg/kg-day)	6.9E-07	2.6E-07	mg/kg/day	NA	NA	NA
				INDENO(1,2,3-c,d)PYRENE	4.8E-01	MG/KG	1.4E-07	mg/kg/day	7.3E-01	1/(mg/kg-day)	1.1E-07	4.0E-07	mg/kg/day	NA	NA	NA
				ALUMINUM	8.5E+03	MG/KG	2.0E-04	mg/kg/day	NA	NA	NA	5.5E-04	mg/kg/day	1.0E+00	mg/kg/day	5.5E-04
				ANTIMONY	2.3E+00	MG/KG	5.2E-08	mg/kg/day	NA	NA	NA	1.5E-07	mg/kg/day	6.0E-05	mg/kg/day	2.4E-03
				ARSENIC	3.5E+00	MG/KG	2.4E-07	mg/kg/day	1.5E+00	1/(mg/kg-day)	3.6E-07	6.8E-07	mg/kg/day	3.0E-04	mg/kg/day	2.3E-03
				CHROMIUM, TOTAL	1.9E+01	MG/KG	4.3E-07	mg/kg/day	NA	NA	NA	1.2E-06	mg/kg/day	7.5E-05	mg/kg/day	1.6E-02
				IRON	2.8E+04	MG/KG	6.5E-04	mg/kg/day	NA	NA	NA	1.8E-03	mg/kg/day	3.0E-01	mg/kg/day	6.0E-03
				LEAD	2.8E+02	MG/KG	6.5E-06	mg/kg/day	NA	NA	NA	1.8E-05	mg/kg/day	NA	NA	NA
				MANGANESE	3.4E+02	MG/KG	7.9E-06	mg/kg/day	NA	NA	NA	2.2E-05	mg/kg/day	5.6E-03	mg/kg/day	4.0E-03
				THALLIUM	1.2E+00	MG/KG	2.7E-08	mg/kg/day	NA	NA	NA	7.5E-08	mg/kg/day	8.0E-05	mg/kg/day	9.3E-04
				VANADIUM	4.5E+01	MG/KG	1.0E-06	mg/kg/day	NA	NA	NA	2.9E-06	mg/kg/day	2.6E-05	mg/kg/day	1.1E-01
			Exp. Route Total								2.7E-06					1.4E-01

TABLE 7.6.RME

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

REASONABLE MAXIMUM EXPOSURE

SWMU 6 - Mangrove Disposal Site

NASD, Vieques Island, Puerto Rico

Scenario Timeframe: Future
Receptor Population: Industrial Worker
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Surface Soil	Surface Soil	SWMU 6 Surface Soil	Inhalation													
				BENZO(a)ANTHRACENE	6.3E-01	MG/KG	3.2E-11	mg/kg/day	NA	NA	NA	9.0E-11	mg/kg/day	NA	NA	NA
				BENZO(a)PYRENE	5.9E-01	MG/KG	3.0E-11	mg/kg/day	3.1E+00	1/(mg/kg-day)	9.4E-11	8.5E-11	mg/kg/day	NA	NA	NA
				BENZO(b)FLUORANTHENE	6.2E-01	MG/KG	3.2E-11	mg/kg/day	NA	NA	NA	8.9E-11	mg/kg/day	NA	NA	NA
				DIBENZ(a,h)ANTHRACENE	3.1E-01	MG/KG	1.6E-11	mg/kg/day	NA	NA	NA	4.5E-11	mg/kg/day	NA	NA	NA
				INDENO(1,2,3-c,d)PYRENE	4.8E-01	MG/KG	2.5E-11	mg/kg/day	NA	NA	NA	6.9E-11	mg/kg/day	NA	NA	NA
				ALUMINUM	8.5E+03	MG/KG	4.4E-07	mg/kg/day	NA	NA	NA	1.2E-06	mg/kg/day	1.4E-03	mg/kg/day	8.6E-04
				ANTIMONY	2.3E+00	MG/KG	1.2E-10	mg/kg/day	NA	NA	NA	3.3E-10	mg/kg/day	NA	NA	NA
				ARSENIC	3.5E+00	MG/KG	1.8E-10	mg/kg/day	1.5E+01	1/(mg/kg-day)	2.7E-09	5.1E-10	mg/kg/day	NA	NA	NA
				CHROMIUM, TOTAL	1.9E+01	MG/KG	9.5E-10	mg/kg/day	4.2E+01	1/(mg/kg-day)	4.0E-08	2.7E-09	mg/kg/day	1.4E-02	mg/kg/day	1.9E-07
				IRON	2.8E+04	MG/KG	1.4E-06	mg/kg/day	NA	NA	NA	4.0E-06	mg/kg/day	NA	NA	NA
				LEAD	2.8E+02	MG/KG	1.4E-08	mg/kg/day	NA	NA	NA	4.1E-08	mg/kg/day	NA	NA	NA
				MANGANESE	3.4E+02	MG/KG	1.8E-08	mg/kg/day	NA	NA	NA	4.9E-08	mg/kg/day	1.4E-05	mg/kg/day	3.5E-03
				THALLIUM	1.2E+00	MG/KG	5.9E-11	mg/kg/day	NA	NA	NA	1.7E-10	mg/kg/day	NA	NA	NA
				VANADIUM	4.5E+01	MG/KG	2.3E-09	mg/kg/day	NA	NA	NA	6.5E-09	mg/kg/day	NA	NA	NA
			Exp. Route Total								4.3E-08					4.3E-03
		Exposure Point Total									7.3E-06					3.3E-01
	Exposure Medium Total										7.3E-06					3.3E-01
Surface Soil Total											7.3E-06					3.3E-01
Groundwater	Groundwater	Tap Water	Ingestion													
				CHLOROFORM	7.6E-01	UG/L	2.6E-06	mg/kg/day	NA	NA	NA	7.4E-06	mg/kg/day	1.0E-02	mg/kg/day	7.4E-04
				PCB-1221 (AROCLOR 1221)	5.0E-01	UG/L	1.7E-06	mg/kg/day	2.0E+00	1/(mg/kg-day)	3.5E-06	4.9E-06	mg/kg/day	NA	mg/kg/day	NA
				PCB-1232 (AROCLOR 1232)	9.0E-02	UG/L	3.1E-07	mg/kg/day	2.0E+00	1/(mg/kg-day)	6.3E-07	8.8E-07	mg/kg/day	NA	mg/kg/day	NA
				Perchlorate	1.3E+01	UG/L	4.5E-05	mg/kg/day	NA	NA	NA	1.3E-04	mg/kg/day	3.0E-05	mg/kg/day	4.2E+00
				ANTIMONY	1.0E+02	UG/L	3.6E-04	mg/kg/day	NA	NA	NA	1.0E-03	mg/kg/day	4.0E-04	mg/kg/day	2.5E+00
				ARSENIC	7.7E+01	UG/L	2.7E-04	mg/kg/day	1.5E+00	1/(mg/kg-day)	4.0E-04	7.5E-04	mg/kg/day	3.0E-04	mg/kg/day	2.5E+00
				BARIUM	4.8E+02	UG/L	1.7E-03	mg/kg/day	NA	NA	NA	4.7E-03	mg/kg/day	7.0E-02	mg/kg/day	6.6E-02
				CADMIUM	9.0E+00	UG/L	3.1E-05	mg/kg/day	NA	NA	NA	8.8E-05	mg/kg/day	5.0E-04	mg/kg/day	1.8E-01
				CHROMIUM, TOTAL	3.3E+01	UG/L	1.2E-04	mg/kg/day	NA	NA	NA	3.3E-04	mg/kg/day	3.0E-03	mg/kg/day	1.1E-01
				IRON	6.1E+03	UG/L	2.1E-02	mg/kg/day	NA	NA	NA	6.0E-02	mg/kg/day	3.0E-01	mg/kg/day	2.0E-01
				MANGANESE	8.8E+03	UG/L	3.1E-02	mg/kg/day	NA	NA	NA	8.6E-02	mg/kg/day	2.0E-02	mg/kg/day	4.3E+00
				SELENIUM	1.3E+02	UG/L	4.6E-04	mg/kg/day	NA	NA	NA	1.3E-03	mg/kg/day	5.0E-03	mg/kg/day	2.6E-01
				SILVER	5.6E+01	UG/L	2.0E-04	mg/kg/day	NA	NA	NA	5.5E-04	mg/kg/day	5.0E-03	mg/kg/day	1.1E-01
				THALLIUM	6.0E+01	UG/L	2.1E-04	mg/kg/day	NA	NA	NA	5.9E-04	mg/kg/day	8.0E-05	mg/kg/day	7.4E+00
			Exp. Route Total								4.1E-04					2.2E+01

TABLE 7.6.RME

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

REASONABLE MAXIMUM EXPOSURE

SWMU 6 - Mangrove Disposal Site

NASD, Vieques Island, Puerto Rico

Scenario Timeframe: Future
Receptor Population: Industrial Worker
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Groundwater	Groundwater	Tap Water	Dermal													
				CHLOROFORM	7.6E-01	UG/L	1.3E-13	mg/kg/day	NA	NA	NA	2.2E-17	mg/kg/day	1.0E-02	mg/kg/day	2.2E-15
				PCB-1221 (AROCLOR 1221)	5.0E-01	UG/L	1.3E-11	mg/kg/day	2.0E+00	1/(mg/kg-day)	2.6E-11	5.4E-16	mg/kg/day	NA	mg/kg/day	NA
				PCB-1232 (AROCLOR 1232)	9.0E-02	UG/L	8.1E-16	mg/kg/day	2.0E+00	1/(mg/kg-day)	1.6E-15	3.4E-18	mg/kg/day	NA	mg/kg/day	NA
				Perchlorate	1.3E+01	UG/L	3.7E-14	mg/kg/day	NA	NA	NA	0.0E+00	mg/kg/day	3.0E-05	mg/kg/day	0.0E+00
				ANTIMONY	1.0E+02	UG/L	3.0E-13	mg/kg/day	NA	NA	NA	2.5E-14	mg/kg/day	6.0E-05	mg/kg/day	4.2E-10
				ARSENIC	7.7E+01	UG/L	2.2E-13	mg/kg/day	1.5E+00	1/(mg/kg-day)	3.3E-13	3.8E-15	mg/kg/day	3.0E-04	mg/kg/day	1.3E-11
				BARIUM	4.8E+02	UG/L	1.4E-12	mg/kg/day	NA	NA	NA	6.1E-14	mg/kg/day	4.9E-03	mg/kg/day	1.2E-11
				CADMIUM	9.0E+00	UG/L	2.6E-14	mg/kg/day	NA	NA	NA	5.5E-16	mg/kg/day	1.3E-05	mg/kg/day	4.4E-11
				CHROMIUM, TOTAL	3.3E+01	UG/L	1.9E-13	mg/kg/day	NA	NA	NA	1.5E-12	mg/kg/day	7.5E-05	mg/kg/day	2.0E-08
				IRON	6.1E+03	UG/L	1.8E-11	mg/kg/day	NA	NA	NA	3.8E-10	mg/kg/day	3.0E-01	mg/kg/day	1.3E-09
				MANGANESE	8.8E+03	UG/L	2.5E-11	mg/kg/day	NA	NA	NA	7.1E-11	mg/kg/day	5.6E-03	mg/kg/day	1.3E-08
				SELENIUM	1.3E+02	UG/L	3.8E-13	mg/kg/day	NA	NA	NA	6.5E-17	mg/kg/day	5.0E-03	mg/kg/day	1.3E-14
				SILVER	5.6E+01	UG/L	9.8E-14	mg/kg/day	NA	NA	NA	0.0E+00	mg/kg/day	2.0E-04	mg/kg/day	0.0E+00
				THALLIUM	6.0E+01	UG/L	1.7E-13	mg/kg/day	NA	NA	NA	4.9E-14	mg/kg/day	8.0E-05	mg/kg/day	6.1E-10
			Exp. Route Total								2.6E-11					3.5E-08
		Exposure Point Total									4.1E-04					2.2E+01
Groundwater Total											4.1E-04					2.2E+01
											Total of Receptor Risks Across All Media					4.1E-04					Total of Receptor Hazards Across All Media	2.2E+01

NA = Not applicable.

Table 7.6.RME Supplement
Calculation of DAevent
Industrial Worker Adult, Groundwater
SWMU 6 - Mangrove Disposal Site
NASD, Vieques Island, Puerto Rico

Chemical of Potential Concern	Groundwater Concentration (CW) (ug/L)	Permeability Coefficient (Kp) (cm/hr)	B (dimensionless)	Lag Time (τ_{event}) (hr)	t* (hr)	Fraction Absorbed Water (FA) (dimensionless)	Duration of Event (tevent) (hr)	DAevent (mg/cm^2-event)	Eq
CHLOROFORM	7.6E-01	6.8E-03	0.0E+00	5.0E-01	1.2E+00	1.0E+00	0.05	2.2E-09	2
PCB-1221 (AROCLOR 1221)	5.0E-01	4.3E-01	3.2E+00	1.1E+01	4.8E+01	5.0E-01	0.05	2.2E-07	2
PCB-1232 (AROCLOR 1232)	9.0E-02	1.5E-04	3.2E+00	1.1E+01	4.8E+01	5.0E-01	0.05	1.4E-11	2
Perchlorate	1.3E+01	1.0E-03	NA	NA	NA	NA	0.05	6.4E-10	1
ANTIMONY	1.0E+02	1.0E-03	NA	NA	NA	NA	0.05	5.2E-09	1
ARSENIC	7.7E+01	1.0E-03	NA	NA	NA	NA	0.05	3.8E-09	1
BARIUM	4.8E+02	1.0E-03	NA	NA	NA	NA	0.05	2.4E-08	1
CADMIUM	9.0E+00	1.0E-03	NA	NA	NA	NA	0.05	4.5E-10	1
CHROMIUM, TOTAL	3.3E+01	2.0E-03	NA	NA	NA	NA	0.05	3.3E-09	1
IRON	6.1E+03	1.0E-03	NA	NA	NA	NA	0.05	3.0E-07	1
MANGANESE	8.8E+03	1.0E-03	NA	NA	NA	NA	0.05	4.4E-07	1
SELENIUM	1.3E+02	1.0E-03	NA	NA	NA	NA	0.05	6.7E-09	1
SILVER	5.6E+01	6.0E-04	NA	NA	NA	NA	0.05	1.7E-09	1
THALLIUM	6.0E+01	1.0E-03	NA	NA	NA	NA	0.05	3.0E-09	1

Inorganics: DAevent (mg/cm2-event) =

Kp x CW x tevent x 0.001 mg/ug x 0.001 l/cm^3 (eq 1)

Organics: DAevent (mg/cm2-event) =

$$\text{If } t_{event} \le t^*, \text{then } DA_{event} = 2 \times FA \times K_p \times C_w \sqrt{\frac{6 \times \tau_{event} \times t_{event}}{\pi}} \qquad \text{(eq 2)}$$

$$\text{If } t_{event} \ge t^*, \text{then } DA_{event} = FA \times K_p \times C_w \left[\frac{t_{event}}{1+B} + 2 \times \tau_{event} \left(\frac{1+3B+3B^2}{(1+B)^2} \right) \right] \qquad \text{(eq 3)}$$

Notes:

Permeability constants from EPA 2001, *Risk Assessment Guidance for Superfund Volume I: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment - Interim).* EPA/540/R/99/005. The default value of 0.001 was assigned to inorganics not listed in this document.

NA - not applicable.

TABLE 7.7.RME

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

REASONABLE MAXIMUM EXPOSURE

SWMU 6 - Mangrove Disposal Site

NASD, Vieques Island, Puerto Rico

Scenario Timeframe: Future
Receptor Population: Maintenance Worker
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Surface Soil	Surface Soil	SWMU 6 Surface Soil	Ingestion													
				BENZO(a)ANTHRACENE	6.3E-01	MG/KG	4.5E-08	mg/kg/day	7.3E-01	1/(mg/kg-day)	3.3E-08	1.3E-07	mg/kg/day	NA	NA	NA
				BENZO(a)PYRENE	5.9E-01	MG/KG	4.3E-08	mg/kg/day	7.3E+00	1/(mg/kg-day)	3.1E-07	1.2E-07	mg/kg/day	NA	NA	NA
				BENZO(b)FLUORANTHENE	6.2E-01	MG/KG	4.5E-08	mg/kg/day	7.3E-01	1/(mg/kg-day)	3.3E-08	1.3E-07	mg/kg/day	NA	NA	NA
				DIBENZ(a,h)ANTHRACENE	3.1E-01	MG/KG	2.3E-08	mg/kg/day	7.3E+00	1/(mg/kg-day)	1.7E-07	6.4E-08	mg/kg/day	NA	NA	NA
				INDENO(1,2,3-c,d)PYRENE	4.8E-01	MG/KG	3.5E-08	mg/kg/day	7.3E-01	1/(mg/kg-day)	2.6E-08	9.8E-08	mg/kg/day	NA	NA	NA
				ALUMINUM	8.5E+03	MG/KG	6.2E-04	mg/kg/day	NA	NA	NA	1.7E-03	mg/kg/day	1.0E+00	mg/kg/day	1.7E-03
				ANTIMONY	2.3E+00	MG/KG	1.6E-07	mg/kg/day	NA	NA	NA	4.6E-07	mg/kg/day	4.0E-04	mg/kg/day	1.2E-03
				ARSENIC	3.5E+00	MG/KG	2.6E-07	mg/kg/day	1.5E+00	1/(mg/kg-day)	3.8E-07	7.1E-07	mg/kg/day	3.0E-04	mg/kg/day	2.4E-03
				CHROMIUM, TOTAL	1.9E+01	MG/KG	1.3E-06	mg/kg/day	NA	NA	NA	3.8E-06	mg/kg/day	3.0E-03	mg/kg/day	1.3E-03
				IRON	2.8E+04	MG/KG	2.0E-03	mg/kg/day	NA	NA	NA	5.7E-03	mg/kg/day	3.0E-01	mg/kg/day	1.9E-02
				LEAD	2.8E+02	MG/KG	2.0E-05	mg/kg/day	NA	NA	NA	5.7E-05	mg/kg/day	NA	NA	NA
				MANGANESE	3.4E+02	MG/KG	2.5E-05	mg/kg/day	NA	NA	NA	7.0E-05	mg/kg/day	1.4E-01	mg/kg/day	5.0E-04
				THALLIUM	1.2E+00	MG/KG	8.4E-08	mg/kg/day	NA	NA	NA	2.3E-07	mg/kg/day	8.0E-05	mg/kg/day	2.9E-03
				VANADIUM	4.5E+01	MG/KG	3.3E-06	mg/kg/day	NA	NA	NA	9.2E-06	mg/kg/day	1.0E-03	mg/kg/day	9.2E-03
			Exp. Route Total								9.5E-07					3.8E-02
			Dermal													
				BENZO(a)ANTHRACENE	6.3E-01	MG/KG	3.9E-08	mg/kg/day	7.3E-01	1/(mg/kg-day)	2.8E-08	1.1E-07	mg/kg/day	NA	NA	NA
				BENZO(a)PYRENE	5.9E-01	MG/KG	3.7E-08	mg/kg/day	7.3E+00	1/(mg/kg-day)	2.7E-07	1.0E-07	mg/kg/day	NA	NA	NA
				BENZO(b)FLUORANTHENE	6.2E-01	MG/KG	3.8E-08	mg/kg/day	7.3E-01	1/(mg/kg-day)	2.8E-08	1.1E-07	mg/kg/day	NA	NA	NA
				DIBENZ(a,h)ANTHRACENE	3.1E-01	MG/KG	2.0E-08	mg/kg/day	7.3E+00	1/(mg/kg-day)	1.4E-07	5.5E-08	mg/kg/day	NA	NA	NA
				INDENO(1,2,3-c,d)PYRENE	4.8E-01	MG/KG	3.0E-08	mg/kg/day	7.3E-01	1/(mg/kg-day)	2.2E-08	8.4E-08	mg/kg/day	NA	NA	NA
				ALUMINUM	8.5E+03	MG/KG	4.1E-05	mg/kg/day	NA	NA	NA	1.1E-04	mg/kg/day	1.0E+00	mg/kg/day	1.1E-04
				ANTIMONY	2.3E+00	MG/KG	1.1E-08	mg/kg/day	NA	NA	NA	3.0E-08	mg/kg/day	6.0E-05	mg/kg/day	5.1E-04
				ARSENIC	3.5E+00	MG/KG	5.1E-08	mg/kg/day	1.5E+00	1/(mg/kg-day)	7.6E-08	1.4E-07	mg/kg/day	3.0E-04	mg/kg/day	4.7E-04
				CHROMIUM, TOTAL	1.9E+01	MG/KG	8.9E-08	mg/kg/day	NA	NA	NA	2.5E-07	mg/kg/day	7.5E-05	mg/kg/day	3.3E-03
				IRON	2.8E+04	MG/KG	1.3E-04	mg/kg/day	NA	NA	NA	3.8E-04	mg/kg/day	3.0E-01	mg/kg/day	1.3E-03
				LEAD	2.8E+02	MG/KG	1.4E-06	mg/kg/day	NA	NA	NA	3.8E-06	mg/kg/day	NA	NA	NA
				MANGANESE	3.4E+02	MG/KG	1.6E-06	mg/kg/day	NA	NA	NA	4.6E-06	mg/kg/day	5.6E-03	mg/kg/day	8.2E-04
				THALLIUM	1.2E+00	MG/KG	5.5E-09	mg/kg/day	NA	NA	NA	1.5E-08	mg/kg/day	8.0E-05	mg/kg/day	1.9E-04
				VANADIUM	4.5E+01	MG/KG	2.2E-07	mg/kg/day	NA	NA	NA	6.1E-07	mg/kg/day	2.6E-05	mg/kg/day	2.3E-02
			Exp. Route Total								5.7E-07					3.0E-02

TABLE 7.7.RME

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

REASONABLE MAXIMUM EXPOSURE

SWMU 6 - Mangrove Disposal Site

NASD, Vieques Island, Puerto Rico

Scenario Timeframe: Future
Receptor Population: Maintenance Worker
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Surface Soil	Surface Soil	SWMU 6 Surface Soil	Inhalation													
				BENZO(a)ANTHRACENE	6.3E-01	MG/KG	6.7E-12	mg/kg/day	NA	NA	NA	1.9E-11	mg/kg/day	NA	NA	NA
				BENZO(a)PYRENE	5.9E-01	MG/KG	6.3E-12	mg/kg/day	3.1E+00	1/(mg/kg-day)	2.0E-11	1.8E-11	mg/kg/day	NA	NA	NA
				BENZO(b)FLUORANTHENE	6.2E-01	MG/KG	6.6E-12	mg/kg/day	NA	NA	NA	1.8E-11	mg/kg/day	NA	NA	NA
				DIBENZ(a,h)ANTHRACENE	3.1E-01	MG/KG	3.4E-12	mg/kg/day	NA	NA	NA	9.4E-12	mg/kg/day	NA	NA	NA
				INDENO(1,2,3-c,d)PYRENE	4.8E-01	MG/KG	5.1E-12	mg/kg/day	NA	NA	NA	1.4E-11	mg/kg/day	NA	NA	NA
				ALUMINUM	8.5E+03	MG/KG	9.1E-08	mg/kg/day	NA	NA	NA	2.6E-07	mg/kg/day	1.4E-03	mg/kg/day	1.8E-04
				ANTIMONY	2.3E+00	MG/KG	2.4E-11	mg/kg/day	NA	NA	NA	6.8E-11	mg/kg/day	NA	NA	NA
				ARSENIC	3.5E+00	MG/KG	3.8E-11	mg/kg/day	1.5E+01	1/(mg/kg-day)	5.7E-10	1.1E-10	mg/kg/day	NA	NA	NA
				CHROMIUM, TOTAL	1.9E+01	MG/KG	2.0E-10	mg/kg/day	4.2E+01	1/(mg/kg-day)	8.3E-09	5.6E-10	mg/kg/day	1.4E-02	mg/kg/day	3.9E-08
				IRON	2.8E+04	MG/KG	3.0E-07	mg/kg/day	NA	NA	NA	8.4E-07	mg/kg/day	NA	NA	NA
				LEAD	2.8E+02	MG/KG	3.0E-09	mg/kg/day	NA	NA	NA	8.4E-09	mg/kg/day	NA	NA	NA
				MANGANESE	3.4E+02	MG/KG	3.7E-09	mg/kg/day	NA	NA	NA	1.0E-08	mg/kg/day	1.4E-05	mg/kg/day	7.2E-04
				THALLIUM	1.2E+00	MG/KG	1.2E-11	mg/kg/day	NA	NA	NA	3.5E-11	mg/kg/day	NA	NA	NA
				VANADIUM	4.5E+01	MG/KG	4.8E-10	mg/kg/day	NA	NA	NA	1.4E-09	mg/kg/day	NA	NA	NA
			Exp. Route Total								8.9E-09					9.0E-04
		Exposure Point Total									1.5E-06					6.9E-02
	Exposure Medium Total										1.5E-06					6.9E-02
Surface Soil Total											1.5E-06					6.9E-02
										Total of Receptor Risks Across All Media	1.5E-06				Total of Receptor Hazards Across All Media	6.9E-02

NA = Not applicable.

TABLE 7.8.RME

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

REASONABLE MAXIMUM EXPOSURE

SWMU 6 - Mangrove Disposal Site

NASD, Vieques Island, Puerto Rico

Scenario Timeframe: Future
Receptor Population: Utility Worker
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Subsurface Soil	Subsurface Soil	SWMU 6 Subsurface Soil	Ingestion	ARSENIC	1.8E+00	MG/KG	4.0E-08	mg/kg/day	1.5E+00	1/(mg/kg-day)	6.1E-08	5.6E-06	mg/kg/day	3.0E-04	mg/kg/day	1.9E-02
			Exp. Route Total								6.1E-08					1.9E-02
			Dermal	ARSENIC	1.8E+00	MG/KG	3.6E-09	mg/kg/day	1.5E+00	1/(mg/kg-day)	5.5E-09	5.1E-07	mg/kg/day	3.0E-04	mg/kg/day	1.7E-03
			Exp. Route Total								5.5E-09					1.7E-03
			Inhalation	ARSENIC	1.8E+00	MG/KG	1.8E-12	mg/kg/day	1.5E+01	1/(mg/kg-day)	2.7E-11	2.5E-10	mg/kg/day	NA	NA	NA
			Exp. Route Total								2.7E-11					0.0E+00
		Exposure Point Total									6.6E-08					2.0E-02
	Exposure Medium Total										6.6E-08					2.0E-02
Subsurface Soil Total											6.6E-08					2.0E-02
										Total of Receptor Risks Across All Media	6.6E-08				Total of Receptor Hazards Across All Media	2.0E-02

NA = Not applicable.

TABLE 9.1.RME

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

REASONABLE MAXIMUM EXPOSURE

SWMU 6 - Mangrove Disposal Site

NASD, Vieques Island, Puerto Rico

Scenario Timeframe: Current/Future
Receptor Population: Recreational
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk				Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Surface Soil	Surface Soil	SWMU 6 Surface Soil										
			BENZO(a)ANTHRACENE	6.4E-08	NA	9.4E-08	1.6E-07	NA	NA	NA	NA	0.0E+00
			BENZO(a)PYRENE	6.0E-07	3.7E-11	8.9E-07	1.5E-06	NA	NA	NA	NA	0.0E+00
			BENZO(b)FLUORANTHENE	6.3E-08	NA	9.3E-08	1.6E-07	NA	NA	NA	NA	0.0E+00
			DIBENZ(a,h)ANTHRACENE	3.2E-07	NA	4.7E-07	7.9E-07	NA	NA	NA	NA	0.0E+00
			INDENO(1,2,3-c,d)PYRENE	4.9E-08	NA	7.3E-08	1.2E-07	NA	NA	NA	NA	0.0E+00
			ALUMINUM	NA	NA	NA	0.0E+00	CNS	3.5E-03	3.6E-04	4.0E-04	4.2E-03
			ANTIMONY	NA	NA	NA	0.0E+00	Blood	2.3E-03	NA	1.8E-03	4.1E-03
			ARSENIC	7.4E-07	1.1E-09	2.5E-07	9.9E-07	Skin, Vascular	4.8E-03	NA	1.6E-03	6.4E-03
			CHROMIUM, TOTAL	NA	1.6E-08	NA	1.6E-08	NOAEL	2.5E-03	7.8E-08	1.1E-02	1.4E-02
			IRON	NA	NA	NA	0.0E+00	Blood, Gastrointestinal, Liver	3.8E-02	NA	4.3E-03	4.2E-02
			LEAD	NA	NA	NA	0.0E+00	NA	NA	NA	NA	0.0E+00
			MANGANESE	NA	NA	NA	0.0E+00	CNS	1.0E-03	1.4E-03	2.8E-03	5.3E-03
			THALLIUM	NA	NA	NA	0.0E+00	Liver, Blood, Hair	5.9E-03	NA	6.7E-04	6.5E-03
			VANADIUM	NA	NA	NA	0.0E+00	Kidney	1.8E-02	NA	8.1E-02	9.9E-02
Chemical Total				1.8E-06	1.7E-08	1.9E-06	3.7E-06		7.6E-02	1.8E-03	1.0E-01	1.8E-01
Medium Total							3.7E-06					1.8E-01
Sediment	Sediment	Kiani Lagoon										
			BENZO(a)PYRENE	2.0E-08	NA	9.8E-09	3.0E-08	NA	NA	NA	NA	0.0E+00
			ALUMINUM	NA	NA	NA	0.0E+00	CNS	1.3E-03	NA	4.9E-04	1.8E-03
			ANTIMONY	NA	NA	NA	0.0E+00	Blood	9.6E-03	NA	2.4E-02	3.3E-02
			ARSENIC	1.1E-05	NA	1.3E-05	2.4E-05	Skin, Vascular	7.3E-02	NA	8.1E-02	1.5E-01
			BARIUM	NA	NA	NA	0.0E+00	NOAEL	3.3E-04	NA	1.7E-03	2.1E-03
			CADMIUM	NA	NA	NA	0.0E+00	Kidney	5.4E-04	NA	8.0E-03	8.6E-03
			CHROMIUM, TOTAL	NA	NA	NA	0.0E+00	NOAEL	7.6E-04	NA	1.1E-02	1.2E-02
			IRON	NA	NA	NA	0.0E+00	Blood, Gastrointestinal, Liver	7.3E-03	NA	2.7E-03	1.0E-02
			LEAD	NA	NA	NA	0.0E+00	NA	NA	NA	NA	0.0E+00
			MANGANESE	NA	NA	NA	0.0E+00	CNS	2.0E-04	NA	1.8E-03	2.0E-03
			SELENIUM	NA	NA	NA	0.0E+00	Whole Body	4.2E-03	NA	1.6E-03	5.8E-03
			THALLIUM	NA	NA	NA	0.0E+00	Kidney	4.2E-01	NA	1.6E-01	5.8E-01
			VANADIUM	NA	NA	NA	0.0E+00	Kidney	5.5E-03	NA	7.9E-02	8.5E-02
Chemical Total				1.1E-05	0.0E+00	1.3E-05	2.4E-05		5.2E-01	0.0E+00	3.7E-01	8.9E-01
Medium Total							2.4E-05					8.9E-01
Surface Water	Surface Water	Kiani Lagoon										
			ARSENIC	3.6E-07	NA	7.5E-08	4.4E-07	Skin, Vascular	2.3E-03	NA	4.8E-04	2.8E-03
			IRON	NA	NA	NA	0.0E+00	Blood, Gastrointestinal, Liver	4.5E-04	NA	9.2E-05	5.4E-04
			MERCURY	NA	NA	NA	0.0E+00	Immune System	6.4E-04	NA	1.9E-03	2.5E-03
			THALLIUM	NA	NA	NA	0.0E+00	Kidney	8.1E-03	NA	1.7E-03	9.8E-03
Chemical Total				3.6E-07	0.0E+00	7.5E-08	4.4E-07		1.2E-02	NA	4.1E-03	1.6E-02
Medium Total							4.4E-07					1.6E-02
Receptor Total							2.8E-05				Receptor HI Total	1.1E+00

HI - Hazard Index

CNS - Central Nervous System

NOAEL = No Observed Adverse Effects Level

Total CNS HI Across All Media =	1.3E-02
Total Skin HI Across All Media =	1.6E-01
Total Vascular HI Across All Media =	1.6E-01
Total Kidney HI Across All Media =	7.8E-01
Total NOAEL HI Across All Media =	2.8E-02
Total Gastrointestinal HI Across All Media =	5.3E-02
Total Blood HI Across All Media =	9.7E-02
Total Liver HI Across All Media =	5.9E-02
Total Hair HI Across All Media =	6.5E-03
Total Whole Body HI Across All Media =	5.8E-03
Total Immune System HI Across All Media =	2.5E-03

TABLE 9.2.RME
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURE
SWMU 6 - Mangrove Disposal Site
NASD, Vieques Island, Puerto Rico

Scenario Timeframe: Current/Future
Receptor Population: Recreational
Receptor Age: Youth

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk				Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Surface Soil	Surface Soil	SWMU 6 Surface Soil										
			BENZO(a)ANTHRACENE	3.6E-08	NA	6.3E-08	9.9E-08	NA	NA	NA	NA	0.0E+00
			BENZO(a)PYRENE	3.4E-07	2.1E-11	5.9E-07	9.3E-07	NA	NA	NA	NA	0.0E+00
			BENZO(b)FLUORANTHENE	3.6E-08	NA	6.2E-08	9.7E-08	NA	NA	NA	NA	0.0E+00
			DIBENZ(a,h)ANTHRACENE	1.8E-07	NA	3.1E-07	5.0E-07	NA	NA	NA	NA	0.0E+00
			INDENO(1,2,3-c,d)PYRENE	2.8E-08	NA	4.8E-08	7.6E-08	NA	NA	NA	NA	0.0E+00
			ALUMINUM	NA	NA	NA	0.0E+00	CNS	4.8E-03	4.9E-04	6.3E-04	5.9E-03
			ANTIMONY	NA	NA	NA	0.0E+00	Blood	3.2E-03	NA	2.8E-03	5.9E-03
			ARSENIC	4.2E-07	6.2E-10	1.7E-07	5.9E-07	Skin, Vascular	6.5E-03	NA	2.6E-03	9.1E-03
			CHROMIUM, TOTAL	NA	9.2E-09	NA	9.2E-09	NOAEL	3.5E-03	1.1E-07	1.8E-02	2.2E-02
			IRON	NA	NA	NA	0.0E+00	Blood, Gastrointestinal, Liver	5.2E-02	NA	6.9E-03	5.9E-02
			LEAD	NA	NA	NA	0.0E+00	NA	NA	NA	NA	0.0E+00
			MANGANESE	NA	NA	NA	0.0E+00	CNS	1.4E-03	2.0E-03	4.5E-03	7.9E-03
			THALLIUM	NA	NA	NA	0.0E+00	Liver, Blood, Hair	8.1E-03	NA	1.1E-03	9.1E-03
			VANADIUM	NA	NA	NA	0.0E+00	Kidney	2.5E-02	NA	1.3E-01	1.5E-01
Chemical Total				1.0E-06	9.8E-09	1.2E-06	2.3E-06		1.0E-01	2.5E-03	1.7E-01	2.7E-01
Medium Total							2.3E-06					2.7E-01
Sediment	Sediment	Kiani Lagoon										
			BENZO(a)PYRENE	1.2E-08	NA	5.6E-09	1.7E-08	NA	NA	NA	NA	0.0E+00
			ALUMINUM	NA	NA	NA	0.0E+00	CNS	1.8E-03	NA	6.7E-04	2.5E-03
			ANTIMONY	NA	NA	NA	0.0E+00	Blood	1.3E-02	NA	3.3E-02	4.6E-02
			ARSENIC	6.4E-06	NA	7.2E-06	1.4E-05	Skin, Vascular	1.0E-01	NA	1.1E-01	2.1E-01
			BARIUM	NA	NA	NA	0.0E+00	NOAEL	4.5E-04	NA	2.4E-03	2.8E-03
			CADMIUM	NA	NA	NA	0.0E+00	Kidney	7.4E-04	NA	1.1E-02	1.2E-02
			CHROMIUM, TOTAL	NA	NA	NA	0.0E+00	NOAEL	1.0E-03	NA	1.6E-02	1.7E-02
			IRON	NA	NA	NA	0.0E+00	Blood, Gastrointestinal, Liver	1.0E-02	NA	3.8E-03	1.4E-02
			LEAD	NA	NA	NA	0.0E+00	NA	NA	NA	NA	0.0E+00
			MANGANESE	NA	NA	NA	0.0E+00	CNS	2.7E-04	NA	2.5E-03	2.8E-03
			SELENIUM	NA	NA	NA	0.0E+00	Whole Body	5.8E-03	NA	2.2E-03	8.0E-03
			THALLIUM	NA	NA	NA	0.0E+00	Kidney	5.8E-01	NA	2.1E-01	7.9E-01
			VANADIUM	NA	NA	NA	0.0E+00	Kidney	7.6E-03	NA	1.1E-01	1.2E-01
Chemical Total				6.4E-06	0.0E+00	7.2E-06	1.4E-05		7.2E-01	0.0E+00	5.0E-01	1.2E+00
Medium Total							1.4E-05					1.2E+00
Surface Water	Surface Water	Kiani Lagoon										
			ARSENIC	2.1E-07	NA	3.3E-08	2.4E-07	Skin, Vascular	3.2E-03	NA	5.1E-04	3.7E-03
			IRON	NA	NA	NA	0.0E+00	Blood, Gastrointestinal, Liver	6.1E-04	NA	9.8E-05	7.1E-04
			MERCURY	NA	NA	NA	0.0E+00	Immune System	8.8E-04	NA	2.0E-03	2.9E-03
			THALLIUM	NA	NA	NA	0.0E+00	Kidney	1.1E-02	NA	1.8E-03	1.3E-02
Chemical Total				2.1E-07	0.0E+00	3.3E-08	2.4E-07		1.6E-02	NA	4.4E-03	2.0E-02
Medium Total							2.4E-07					2.0E-02
Receptor Total							1.6E-05				Receptor HI Total	1.5E+00

HI - Hazard Index
CNS - Central Nervous System
NOAEL = No Observed Adverse Effects Level

Total CNS HI Across All Media =	1.9E-02
Total Skin HI Across All Media =	2.2E-01
Total Vascular HI Across All Media =	2.2E-01
Total Kidney HI Across All Media =	1.1E+00
Total NOAEL HI Across All Media =	4.1E-02
Total Gastrointestinal HI Across All Media =	7.4E-02
Total Blood HI Across All Media =	1.3E-01
Total Liver HI Across All Media =	8.3E-02
Total Hair HI Across All Media =	9.1E-03
Total Whole Body HI Across All Media =	8.0E-03
Total Immune System HI Across All Media =	2.9E-03

TABLE 9.3.RME
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURE
SWMU 6 - Mangrove Disposal Site
NASD, Vieques Island, Puerto Rico

Scenario Timeframe: Current/Future
Receptor Population: Recreational
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk				Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Surface Soil	Surface Soil	SWMU 6 Surface Soil										
			BENZO(a)ANTHRACENE	1.5E-07	NA	5.4E-08	2.0E-07	NA	NA	NA	NA	0.0E+00
			BENZO(a)PYRENE	1.4E-06	2.2E-11	5.1E-07	1.9E-06	NA	NA	NA	NA	0.0E+00
			BENZO(b)FLUORANTHENE	1.5E-07	NA	5.3E-08	2.0E-07	NA	NA	NA	NA	0.0E+00
			DIBENZ(a,h)ANTHRACENE	7.5E-07	NA	2.7E-07	1.0E-06	NA	NA	NA	NA	0.0E+00
			INDENO(1,2,3-c,d)PYRENE	1.1E-07	NA	4.2E-08	1.6E-07	NA	NA	NA	NA	0.0E+00
			ALUMINUM	NA	NA	NA	0.0E+00	CNS	3.2E-02	8.3E-04	9.1E-04	3.4E-02
			ANTIMONY	NA	NA	NA	0.0E+00	Blood	2.1E-02	NA	4.0E-03	2.6E-02
			ARSENIC	1.7E-06	6.3E-10	1.4E-07	1.9E-06	Skin, Vascular	4.4E-02	NA	3.7E-03	4.8E-02
			CHROMIUM, TOTAL	NA	9.3E-09	NA	9.3E-09	NOAEL	2.4E-02	1.8E-07	2.6E-02	5.0E-02
			IRON	NA	NA	NA	0.0E+00	Blood, Gastrointestinal, Liver	3.5E-01	NA	9.9E-03	3.6E-01
			LEAD	NA	NA	NA	0.0E+00	NA	NA	NA	NA	0.0E+00
			MANGANESE	NA	NA	NA	0.0E+00	CNS	9.3E-03	3.4E-03	6.5E-03	1.9E-02
			THALLIUM	NA	NA	NA	0.0E+00	Liver, Blood, Hair	5.5E-02	NA	1.5E-03	5.6E-02
			VANADIUM	NA	NA	NA	0.0E+00	Kidney	1.7E-01	NA	1.9E-01	3.6E-01
Chemical Total				4.3E-06	1.0E-08	1.1E-06	5.4E-06		7.1E-01	4.2E-03	2.4E-01	9.5E-01
Medium Total							5.4E-06					9.5E-01
Sediment	Sediment	Kiani Lagoon										
			BENZO(a)PYRENE	4.7E-08	NA	4.4E-09	5.2E-08	NA	NA	NA	NA	0.0E+00
			ALUMINUM	NA	NA	NA	0.0E+00	CNS	1.2E-02	NA	8.8E-04	1.3E-02
			ANTIMONY	NA	NA	NA	0.0E+00	Blood	8.9E-02	NA	4.3E-02	1.3E-01
			ARSENIC	2.6E-05	NA	5.7E-06	3.2E-05	Skin, Vascular	6.8E-01	NA	1.5E-01	8.3E-01
			BARIUM	NA	NA	NA	0.0E+00	NOAEL	3.0E-03	NA	3.1E-03	6.2E-03
			CADMIUM	NA	NA	NA	0.0E+00	Kidney	5.0E-03	NA	1.4E-02	1.9E-02
			CHROMIUM, TOTAL	NA	NA	NA	0.0E+00	NOAEL	7.1E-03	NA	2.0E-02	2.8E-02
			IRON	NA	NA	NA	0.0E+00	Blood, Gastrointestinal, Liver	6.9E-02	NA	4.9E-03	7.3E-02
			LEAD	NA	NA	NA	0.0E+00	NA	NA	NA	NA	0.0E+00
			MANGANESE	NA	NA	NA	0.0E+00	CNS	1.8E-03	NA	3.3E-03	5.1E-03
			SELENIUM	NA	NA	NA	0.0E+00	Whole Body	3.9E-02	NA	2.8E-03	4.2E-02
			THALLIUM	NA	NA	NA	0.0E+00	Kidney	3.9E+00	NA	2.8E-01	4.2E+00
			VANADIUM	NA	NA	NA	0.0E+00	Kidney	5.2E-02	NA	1.4E-01	1.9E-01
Chemical Total				2.6E-05	0.0E+00	5.7E-06	3.2E-05		4.9E+00	0.0E+00	6.6E-01	5.5E+00
Medium Total							3.2E-05					5.5E+00
Surface Water	Surface Water	Kiani Lagoon										
			ARSENIC	4.2E-07	NA	3.4E-08	4.5E-07	Skin, Vascular	1.1E-02	NA	8.7E-04	1.2E-02
			IRON	NA	NA	NA	0.0E+00	Blood, Gastrointestinal, Liver	2.1E-03	NA	1.7E-04	2.2E-03
			MERCURY	NA	NA	NA	0.0E+00	Immune System	3.0E-03	NA	3.4E-03	6.4E-03
			THALLIUM	NA	NA	NA	0.0E+00	Kidney	3.8E-02	NA	3.0E-03	4.1E-02
Chemical Total				4.2E-07	0.0E+00	3.4E-08	4.5E-07		5.4E-02	NA	7.5E-03	6.1E-02
Medium Total							4.5E-07					6.1E-02
Receptor Total							3.8E-05				Receptor HI Total	6.6E+00

HI - Hazard Index
CNS - Central Nervous System
NOAEL = No Observed Adverse Effects Level

Total CNS HI Across All Media =	7.2E-02
Total Skin HI Across All Media =	8.9E-01
Total Vascular HI Across All Media =	8.9E-01
Total Kidney HI Across All Media =	4.8E+00
Total NOAEL HI Across All Media =	8.4E-02
Total Gastrointestinal HI Across All Media =	4.4E-01
Total Blood HI Across All Media =	6.5E-01
Total Liver HI Across All Media =	5.0E-01
Total Hair HI Across All Media =	5.6E-02
Total Whole Body HI Across All Media =	4.2E-02
Total Immune System HI Across All Media =	6.4E-03

TABLE 9.4.RME
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURE
SWMU 6 - Mangrove Disposal Site
NASD, Vieques Island, Puerto Rico

Scenario Timeframe: Future
Receptor Population: Residential
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk				Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Surface Soil	Surface Soil	SWMU 6 Surface Soil										
			BENZO(a)ANTHRACENE	2.1E-07	NA	1.1E-07	3.3E-07	NA	NA	NA	NA	0.0E+00
			BENZO(a)PYRENE	2.0E-06	1.3E-10	1.0E-06	3.1E-06	NA	NA	NA	NA	0.0E+00
			BENZO(b)FLUORANTHENE	2.1E-07	NA	1.1E-07	3.2E-07	NA	NA	NA	NA	0.0E+00
			DIBENZ(a,h)ANTHRACENE	1.1E-06	NA	5.6E-07	1.6E-06	NA	NA	NA	NA	0.0E+00
			INDENO(1,2,3-c,d)PYRENE	1.6E-07	NA	8.6E-08	2.5E-07	NA	NA	NA	NA	0.0E+00
			ALUMINUM	NA	NA	NA	0.0E+00	CNS	1.2E-02	1.2E-03	4.7E-04	1.3E-02
			ANTIMONY	NA	NA	NA	0.0E+00	Blood	7.7E-03	NA	2.1E-03	9.8E-03
			ARSENIC	2.5E-06	3.7E-09	3.0E-07	2.8E-06	Skin, Vascular	1.6E-02	NA	1.9E-03	1.8E-02
			CHROMIUM, TOTAL	NA	5.4E-08	NA	5.4E-08	NOAEL	8.5E-03	2.6E-07	1.4E-02	2.2E-02
			IRON	NA	NA	NA	0.0E+00	Blood, Gastrointestinal, Liver	1.3E-01	NA	5.1E-03	1.3E-01
			LEAD	NA	NA	NA	0.0E+00	NA	NA	NA	NA	0.0E+00
			MANGANESE	NA	NA	NA	0.0E+00	CNS	3.4E-03	4.8E-03	3.4E-03	1.2E-02
			THALLIUM	NA	NA	NA	0.0E+00	Liver, Blood, Hair	2.0E-02	NA	7.9E-04	2.1E-02
			VANADIUM	NA	NA	NA	0.0E+00	Kidney	6.2E-02	NA	9.5E-02	1.6E-01
Chemical Total				6.2E-06	5.8E-08	2.2E-06	8.4E-06		2.6E-01	6.0E-03	1.2E-01	3.9E-01
Subsurface Soil	Subsurface Soil	SWMU 6 Subsurface Soil										
			ARSENIC	1.2E-06	1.8E-09	1.5E-07	1.4E-06	Skin, Vascular	8.0E-03	NA	9.6E-04	8.0E-03
Chemical Total				1.2E-06	1.8E-09	1.5E-07	1.4E-06		8.0E-03	0.0E+00	9.6E-04	9.0E-03
Medium Total							9.8E-06					3.9E-01
Groundwater	Groundwater	Tap Water										
			CHLOROFORM	NA	NA	NA	0.0E+00	Liver, Blood	2.1E-03	NA	1.9E-10	2.1E-03
			PCB-1221 (AROCLOR 1221)	9.3E-06	NA	1.3E-10	9.3E-06	NA	NA	NA	NA	0.0E+00
			PCB-1232 (AROCLOR 1232)	1.7E-06	NA	8.1E-15	1.7E-06	NA	NA	NA	NA	0.0E+00
			Perchlorate	NA	NA	NA	0.0E+00	Thyroid	1.2E+01	NA	6.1E-08	1.2E+01
			ANTIMONY	NA	NA	NA	0.0E+00	Blood	7.1E+00	NA	2.5E-07	7.1E+00
			ARSENIC	1.1E-03	NA	5.6E-12	1.1E-03	Skin, Vascular	7.0E+00	NA	3.7E-08	7.0E+00
			BARIUM	NA	NA	NA	0.0E+00	NOAEL	1.9E-01	NA	1.4E-08	1.9E-01
			CADMIUM	NA	NA	NA	0.0E+00	Kidney	4.9E-01	NA	1.0E-07	4.9E-01
			CHROMIUM, TOTAL	NA	NA	NA	0.0E+00	NOAEL	3.0E-01	NA	1.3E-07	3.0E-01
			IRON	NA	NA	NA	0.0E+00	Blood, Gastrointestinal, Liver	5.6E-01	NA	2.9E-09	5.6E-01
			MANGANESE	NA	NA	NA	0.0E+00	CNS	1.2E+01	NA	2.3E-07	1.2E+01
			SELENIUM	NA	NA	NA	0.0E+00	Whole Body	7.3E-01	NA	3.8E-09	7.3E-01
			SILVER	NA	NA	NA	0.0E+00	Skin	3.1E-01	NA	2.4E-08	3.1E-01
			THALLIUM	NA	NA	NA	0.0E+00	Kidney	2.1E+01	NA	1.1E-07	2.1E+01
Chemical Total				1.1E-03	0.0E+00	1.3E-10	1.1E-03		6.1E+01	NA	9.5E-07	6.1E+01
Medium Total							1.1E-03					6.1E+01
Receptor Total							1.1E-03				Receptor HI Total	6.2E+01

HI - Hazard Index
CNS - Central Nervous System
NOAEL = No Observed Adverse Effects Level

Total CNS HI Across All Media =	1.2E+01
Total Skin HI Across All Media =	7.3E+00
Total Vascular HI Across All Media =	7.0E+00
Total Kidney HI Across All Media =	2.1E+01
Total NOAEL HI Across All Media =	5.1E-01
Total Gastrointestinal HI Across All Media =	6.9E-01
Total Blood HI Across All Media =	7.8E+00
Total Liver HI Across All Media =	7.1E-01
Total Hair HI Across All Media =	2.1E-02
Total Thyroid HI Across All Media =	1.2E+01
Total Whole Body HI Across All Media =	7.3E-01

TABLE 9.5.RME
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURE
SWMU 6 - Mangrove Disposal Site
NASD, Vieques Island, Puerto Rico

Scenario Timeframe: Future
Receptor Population: Residential
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk				Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Surface Soil	Surface Soil	SWMU 6 Surface Soil										
			BENZO(a)ANTHRACENE	5.0E-07	NA	1.8E-07	6.8E-07	NA	NA	NA	NA	0.0E+00
			BENZO(a)PYRENE	4.7E-06	1.3E-09	1.7E-06	6.4E-06	NA	NA	NA	NA	0.0E+00
			BENZO(b)FLUORANTHENE	4.9E-07	NA	1.8E-07	6.7E-07	NA	NA	NA	NA	0.0E+00
			DIBENZ(a,h)ANTHRACENE	2.5E-06	NA	9.1E-07	3.4E-06	NA	NA	NA	NA	0.0E+00
			INDENO(1,2,3-c,d)PYRENE	3.8E-07	NA	1.4E-07	5.2E-07	NA	NA	NA	NA	0.0E+00
			ALUMINUM	NA	NA	NA	0.0E+00	CNS	1.1E-01	4.2E-03	3.1E-03	1.2E-01
			ANTIMONY	NA	NA	NA	0.0E+00	Blood	7.2E-02	NA	1.4E-02	8.6E-02
			ARSENIC	5.8E-06	3.7E-08	4.8E-07	6.3E-06	Skin, Vascular	1.5E-01	NA	1.3E-02	1.6E-01
			CHROMIUM, TOTAL	NA	5.5E-07	NA	5.5E-07	NOAEL	7.9E-02	9.2E-07	8.9E-02	1.7E-01
			IRON	NA	NA	NA	0.0E+00	Blood, Gastrointestinal, Liver	1.2E+00	NA	3.3E-02	1.2E+00
			LEAD	NA	NA	NA	0.0E+00	NA	NA	NA	NA	0.0E+00
			MANGANESE	NA	NA	NA	0.0E+00	CNS	3.1E-02	1.7E-02	2.2E-02	7.0E-02
			THALLIUM	NA	NA	NA	0.0E+00	Liver, Blood, Hair	1.8E-01	NA	5.2E-03	1.9E-01
			VANADIUM	NA	NA	NA	0.0E+00	Kidney	5.8E-01	NA	6.2E-01	1.2E+00
Chemical Total				1.4E-05	5.9E-07	3.6E-06	1.9E-05		2.4E+00	2.1E-02	8.0E-01	3.2E+00
Subsurface Soil	Subsurface Soil	SWMU 6 Subsurface Soil										
			ARSENIC	2.9E-06	1.9E-08	2.4E-07	3.1E-06	Skin, Vascular	7.5E-02	NA	6.3E-03	7.5E-02
Chemical Total				2.9E-06	1.9E-08	2.4E-07	3.1E-06		7.5E-02	0.0E+00	6.3E-03	8.1E-02
Medium Total							2.2E-05					3.3E+00
Groundwater	Groundwater	Tap Water										
			CHLOROFORM	NA	NA	NA	0.0E+00	Liver, Blood	4.8E-03	NA	4.2E-10	4.8E-03
			PCB-1221 (AROCLOR 1221)	5.5E-06	NA	7.2E-11	5.5E-06	NA	NA	NA	NA	0.0E+00
			PCB-1232 (AROCLOR 1232)	9.9E-07	NA	4.5E-15	9.9E-07	NA	NA	NA	NA	0.0E+00
			Perchlorate	NA	NA	NA	0.0E+00	Thyroid	2.7E+01	NA	1.8E-07	2.7E+01
			ANTIMONY	NA	NA	NA	0.0E+00	Blood	1.7E+01	NA	7.3E-07	1.7E+01
			ARSENIC	6.3E-04	NA	4.2E-12	6.3E-04	Skin, Vascular	1.6E+01	NA	1.1E-07	1.6E+01
			BARIUM	NA	NA	NA	0.0E+00	NOAEL	4.3E-01	NA	4.1E-08	4.3E-01
			CADMIUM	NA	NA	NA	0.0E+00	Kidney	1.2E+00	NA	3.0E-07	1.2E+00
			CHROMIUM, TOTAL	NA	NA	NA	0.0E+00	NOAEL	7.1E-01	NA	3.7E-07	7.1E-01
			IRON	NA	NA	NA	0.0E+00	Blood, Gastrointestinal, Liver	1.3E+00	NA	8.6E-09	1.3E+00
			MANGANESE	NA	NA	NA	0.0E+00	CNS	2.8E+01	NA	6.6E-07	2.8E+01
			SELENIUM	NA	NA	NA	0.0E+00	Whole Body	1.7E+00	NA	1.1E-08	1.7E+00
			SILVER	NA	NA	NA	0.0E+00	Skin	7.2E-01	NA	7.1E-08	7.2E-01
			THALLIUM	NA	NA	NA	0.0E+00	Kidney	4.8E+01	NA	3.2E-07	4.8E+01
Chemical Total				6.4E-04	0.0E+00	7.6E-11	6.4E-04		1.4E+02	NA	2.8E-06	1.4E+02
Medium Total							6.4E-04					1.4E+02
Receptor Total							6.6E-04				Receptor HI Total	1.5E+02

HI - Hazard Index
CNS - Central Nervous System
NOAEL = No Observed Adverse Effects Level

Total CNS HI Across All Media =	2.8E+01
Total Skin HI Across All Media =	1.7E+01
Total Vascular HI Across All Media =	1.7E+01
Total Kidney HI Across All Media =	5.1E+01
Total NOAEL HI Across All Media =	1.3E+00
Total Gastrointestinal HI Across All Media =	2.5E+00
Total Blood HI Across All Media =	1.9E+01
Total Liver HI Across All Media =	2.7E+00
Total Hair HI Across All Media =	1.9E-01
Total Thyroid HI Across All Media =	2.7E+01
Total Whole Body HI Across All Media =	1.7E+00

TABLE 9.6.RME

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

REASONABLE MAXIMUM EXPOSURE

SWMU 6 - Mangrove Disposal Site

NASD, Vieques Island, Puerto Rico

Scenario Timeframe: Future

Receptor Population: Industrial Worker

Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk				Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Surface Soil	Surface Soil	SWMU 6 Surface Soil										
			BENZO(a)ANTHRACENE	1.6E-07	NA	1.4E-07	3.0E-07	NA	NA	NA	NA	0.0E+00
			BENZO(a)PYRENE	1.5E-06	9.4E-11	1.3E-06	2.8E-06	NA	NA	NA	NA	0.0E+00
			BENZO(b)FLUORANTHENE	1.6E-07	NA	1.3E-07	2.9E-07	NA	NA	NA	NA	0.0E+00
			DIBENZ(a,h)ANTHRACENE	8.0E-07	NA	6.9E-07	1.5E-06	NA	NA	NA	NA	0.0E+00
			INDENO(1,2,3-c,d)PYRENE	1.2E-07	NA	1.1E-07	2.3E-07	NA	NA	NA	NA	0.0E+00
			ALUMINUM	NA	NA	NA	0.0E+00	CNS	8.3E-03	8.6E-04	5.5E-04	9.8E-03
			ANTIMONY	NA	NA	NA	0.0E+00	Blood	5.5E-03	NA	2.4E-03	8.0E-03
			ARSENIC	1.8E-06	2.7E-09	3.6E-07	2.2E-06	Skin, Vascular	1.1E-02	NA	2.3E-03	1.4E-02
			CHROMIUM, TOTAL	NA	4.0E-08	NA	4.0E-08	NOAEL	6.1E-03	1.9E-07	1.6E-02	2.2E-02
			IRON	NA	NA	NA	0.0E+00	Blood, Gastrointestinal, Liver	9.1E-02	NA	6.0E-03	9.7E-02
			LEAD	NA	NA	NA	0.0E+00	NA	NA	NA	NA	0.0E+00
			MANGANESE	NA	NA	NA	0.0E+00	CNS	2.4E-03	3.5E-03	4.0E-03	9.8E-03
			THALLIUM	NA	NA	NA	0.0E+00	Liver, Blood, Hair	1.4E-02	NA	9.3E-04	1.5E-02
			VANADIUM	NA	NA	NA	0.0E+00	Kidney	4.4E-02	NA	1.1E-01	1.6E-01
Chemical Total				4.6E-06	4.3E-08	2.7E-06	7.3E-06		1.8E-01	4.3E-03	1.4E-01	3.3E-01
Medium Total							7.3E-06					3.3E-01
Groundwater	Groundwater	Tap Water										
			CHLOROFORM	NA	NA	NA	0.0E+00	Liver, Blood	7.4E-04	NA	2.2E-15	7.4E-04
			PCB-1221 (AROCLOR 1221)	3.5E-06	NA	2.6E-11	3.5E-06	NA	NA	NA	NA	0.0E+00
			PCB-1232 (AROCLOR 1232)	6.3E-07	NA	1.6E-15	6.3E-07	NA	NA	NA	NA	0.0E+00
			Perchlorate	NA	NA	NA	0.0E+00	Thyroid	4.2E+00	NA	0.0E+00	4.2E+00
			ANTIMONY	NA	NA	NA	0.0E+00	Blood	2.5E+00	NA	4.2E-10	2.5E+00
			ARSENIC	4.0E-04	NA	3.3E-13	4.0E-04	Skin, Vascular	2.5E+00	NA	1.3E-11	2.5E+00
			BARIUM	NA	NA	NA	0.0E+00	NOAEL	6.6E-02	NA	1.2E-11	6.6E-02
			CADMIUM	NA	NA	NA	0.0E+00	Kidney	1.8E-01	NA	4.4E-11	1.8E-01
			CHROMIUM, TOTAL	NA	NA	NA	0.0E+00	NOAEL	1.1E-01	NA	2.0E-08	1.1E-01
			IRON	NA	NA	NA	0.0E+00	Blood, Gastrointestinal, Liver	2.0E-01	NA	1.3E-09	2.0E-01
			MANGANESE	NA	NA	NA	0.0E+00	CNS	4.3E+00	NA	1.3E-08	4.3E+00
			SELENIUM	NA	NA	NA	0.0E+00	Whole Body	2.6E-01	NA	1.3E-14	2.6E-01
			SILVER	NA	NA	NA	0.0E+00	Skin	1.1E-01	NA	0.0E+00	1.1E-01
			THALLIUM	NA	NA	NA	0.0E+00	Kidney	7.4E+00	NA	6.1E-10	7.4E+00
Chemical Total				4.1E-04	0.0E+00	2.6E-11	4.1E-04		2.2E+01	NA	3.5E-08	2.2E+01
Medium Total							4.1E-04					2.2E+01
Receptor Total							4.1E-04				Receptor HI Total	2.2E+01

HI - Hazard Index

CNS - Central Nervous System

NOAEL = No Observed Adverse Effects Level

Total CNS HI Across All Media =	4.3E+00
Total Skin HI Across All Media =	2.6E+00
Total Vascular HI Across All Media =	2.5E+00
Total Kidney HI Across All Media =	7.7E+00
Total NOAEL HI Across All Media =	2.0E-01
Total Gastrointestinal HI Across All Media =	3.0E-01
Total Blood HI Across All Media =	2.9E+00
Total Liver HI Across All Media =	3.1E-01
Total Hair HI Across All Media =	1.5E-02
Total Thyroid HI Across All Media =	4.2E+00
Total Whole Body HI Across All Media =	2.6E-01

TABLE 9.7.RME
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURE
SWMU 6 - Mangrove Disposal Site
NASD, Vieques Island, Puerto Rico

Scenario Timeframe: Future
Receptor Population: Maintenance Worker
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk				Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Surface Soil	Surface Soil	SWMU 6 Surface Soil										
			BENZO(a)ANTHRACENE	3.3E-08	NA	2.8E-08	6.2E-08	NA	NA	NA	NA	0.0E+00
			BENZO(a)PYRENE	3.1E-07	2.0E-11	2.7E-07	5.8E-07	NA	NA	NA	NA	0.0E+00
			BENZO(b)FLUORANTHENE	3.3E-08	NA	2.8E-08	6.1E-08	NA	NA	NA	NA	0.0E+00
			DIBENZ(a,h)ANTHRACENE	1.7E-07	NA	1.4E-07	3.1E-07	NA	NA	NA	NA	0.0E+00
			INDENO(1,2,3-c,d)PYRENE	2.6E-08	NA	2.2E-08	4.7E-08	NA	NA	NA	NA	0.0E+00
			ALUMINUM	NA	NA	NA	0.0E+00	CNS	1.7E-03	1.8E-04	1.1E-04	2.0E-03
			ANTIMONY	NA	NA	NA	0.0E+00	Blood	1.2E-03	NA	5.1E-04	1.7E-03
			ARSENIC	3.8E-07	5.7E-10	7.6E-08	4.6E-07	Skin, Vascular	2.4E-03	NA	4.7E-04	2.9E-03
			CHROMIUM, TOTAL	NA	8.3E-09	NA	8.3E-09	NOAEL	1.3E-03	3.9E-08	3.3E-03	4.6E-03
			IRON	NA	NA	NA	0.0E+00	Blood, Gastrointestinal, Liver	1.9E-02	NA	1.3E-03	2.0E-02
			LEAD	NA	NA	NA	0.0E+00	NA	NA	NA	NA	0.0E+00
			MANGANESE	NA	NA	NA	0.0E+00	CNS	5.0E-04	7.2E-04	8.2E-04	2.0E-03
			THALLIUM	NA	NA	NA	0.0E+00	Liver, Blood, Hair	2.9E-03	NA	1.9E-04	3.1E-03
			VANADIUM	NA	NA	NA	0.0E+00	Kidney	9.2E-03	NA	2.3E-02	3.3E-02
Chemical Total				9.5E-07	8.9E-09	5.7E-07	1.5E-06		3.8E-02	9.0E-04	3.0E-02	6.9E-02
Medium Total							1.5E-06					6.9E-02
Receptor Total							1.5E-06				Receptor HI Total	6.9E-02

HI - Hazard Index
CNS - Central Nervous System
NOAEL = No Observed Adverse Effects Level

Total CNS HI Across All Media =	4.1E-03
Total Skin HI Across All Media =	2.9E-03
Total Vascular HI Across All Media =	2.9E-03
Total Kidney HI Across All Media =	3.3E-02
Total NOAEL HI Across All Media =	4.6E-03
Total Gastrointestinal HI Across All Media =	2.0E-02
Total Blood HI Across All Media =	2.5E-02
Total Liver HI Across All Media =	2.3E-02
Total Hair HI Across All Media =	3.1E-03

TABLE 9.8.RME

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

REASONABLE MAXIMUM EXPOSURE

SWMU 6 - Mangrove Disposal Site

NASD, Vieques Island, Puerto Rico

Scenario Timeframe: Future
Receptor Population: Construction Worker
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk				Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Subsurface Soil	Subsurface Soil	SWMU 6 Subsurface Soil	ARSENIC	6.1E-08	2.7E-11	5.5E-09	6.6E-08	Skin, Vascular	1.9E-02	NA	1.7E-03	1.9E-02
Chemical Total				6.1E-08	2.7E-11	5.5E-09	6.6E-08		1.9E-02	0.0E+00	1.7E-03	2.0E-02
Medium Total							6.6E-08					2.0E-02
Receptor Total							6.6E-08				Receptor HI Total	2.0E-02

HI - Hazard Index

Total Skin HI Across All Media =	1.9E-02
Total Vascular HI Across All Media =	1.9E-02

TABLE 10.1.RME
RISK SUMMARY
REASONABLE MAXIMUM EXPOSURE
SWMU 6 - Mangrove Disposal Site
NASD, Vieques Island, Puerto Rico

Scenario Timeframe: Current/Future
Receptor Population: Recreational
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk				Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Surface Soil	Surface Soil	SWMU 6 Surface Soil										
Sediment	Sediment	Kiani Lagoon	ARSENIC	1.1E-05	NA	1.3E-05	2.4E-05	Skin, Vascular	7.3E-02	NA	8.1E-02	1.5E-01
			THALLIUM	NA	NA	NA	0.0E+00	Kidney	4.2E-01	NA	1.6E-01	5.8E-01
Chemical Total				1.1E-05	0.0E+00	1.3E-05	2.4E-05		4.9E-01	0.0E+00	2.4E-01	7.3E-01
Medium Total							2.4E-05					7.3E-01
Receptor Total							2.4E-05				Receptor HI Total	7.3E-01

HI - Hazard Index
CNS - Central Nervous System
NOAEL = No Observed Adverse Effects Level

Total Skin HI Across All Media =	1.5E-01
Total Vascular HI Across All Media =	1.5E-01
Total Kidney HI Across All Media =	5.8E-01

TABLE 10.2.RME
RISK SUMMARY
REASONABLE MAXIMUM EXPOSURE
SWMU 6 - Mangrove Disposal Site
NASD, Vieques Island, Puerto Rico

Scenario Timeframe: Current/Future
Receptor Population: Recreational
Receptor Age: Youth

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk				Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Surface Soil	Surface Soil	SWMU 6 Surface Soil	VANADIUM	NA	NA	NA	0.0E+00	Kidney	2.5E-02	NA	1.3E-01	1.5E-01
Chemical Total				0.0E+00	0.0E+00	0.0E+00	0.0E+00		2.5E-02	0.0E+00	1.3E-01	1.5E-01
Medium Total							0.0E+00					1.5E-01
Sediment	Sediment	Kiani Lagoon	ARSENIC	6.4E-06	NA	7.2E-06	1.4E-05	Skin, Vascular	1.0E-01	NA	1.1E-01	2.1E-01
			THALLIUM	NA	NA	NA	0.0E+00	Kidney	5.8E-01	NA	2.1E-01	7.9E-01
			VANADIUM	NA	NA	NA	0.0E+00	Kidney	7.6E-03	NA	1.1E-01	1.2E-01
Chemical Total				6.4E-06	0.0E+00	7.2E-06	1.4E-05		6.8E-01	0.0E+00	4.3E-01	1.1E+00
Medium Total							1.4E-05					1.1E+00
Receptor Total							1.4E-05				Receptor HI Total	1.3E+00

HI - Hazard Index
CNS - Central Nervous System
NOAEL = No Observed Adverse Effects Level

Total Skin HI Across All Media =	2.1E-01
Total Vascular HI Across All Media =	2.1E-01
Total Kidney HI Across All Media =	1.1E+00

TABLE 10.3.RME
RISK SUMMARY
REASONABLE MAXIMUM EXPOSURE
SWMU 6 - Mangrove Disposal Site
NASD, Vieques Island, Puerto Rico

Scenario Timeframe: Current/Future
Receptor Population: Recreational
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk				Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Surface Soil	Surface Soil	SWMU 6 Surface Soil										
			IRON	NA	NA	NA	0.0E+00	Blood, Gastrointestinal, Liver	3.5E-01	NA	9.9E-03	3.6E-01
			VANADIUM	NA	NA	NA	0.0E+00	Kidney	1.7E-01	NA	1.9E-01	3.6E-01
Chemical Total				0.0E+00	0.0E+00	0.0E+00	0.0E+00		5.3E-01	0.0E+00	2.0E-01	7.2E-01
Medium Total							0.0E+00					7.2E-01
Sediment	Sediment	Kiani Lagoon										
			ANTIMONY	NA	NA	NA	0.0E+00	Blood	8.9E-02	NA	4.3E-02	1.3E-01
			ARSENIC	2.6E-05	NA	5.7E-06	3.2E-05	Skin, Vascular	6.8E-01	NA	1.5E-01	8.3E-01
			THALLIUM	NA	NA	NA	0.0E+00	Kidney	3.9E+00	NA	2.8E-01	4.2E+00
			VANADIUM	NA	NA	NA	0.0E+00	Kidney	5.2E-02	NA	1.4E-01	1.9E-01
Chemical Total				2.6E-05	0.0E+00	5.7E-06	3.2E-05		4.7E+00	0.0E+00	6.1E-01	5.3E+00
Medium Total							3.2E-05					5.3E+00
Receptor Total							3.2E-05				Receptor HI Total	6.1E+00

HI - Hazard Index
CNS - Central Nervous System
NOAEL = No Observed Adverse Effects Level

Total Skin HI Across All Media =	8.3E-01
Total Vascular HI Across All Media =	8.3E-01
Total Kidney HI Across All Media =	4.7E+00
Total Gastrointestinal HI Across All Media =	3.6E-01
Total Blood HI Across All Media =	5.0E-01
Total Liver HI Across All Media =	3.6E-01

TABLE 10.4.RME

RISK SUMMARY

REASONABLE MAXIMUM EXPOSURE

SWMU 6 - Mangrove Disposal Site

NASD, Vieques Island, Puerto Rico

Scenario Timeframe: Future
Receptor Population: Residential
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk				Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Surface Soil	Surface Soil	SWMU 6 Surface Soil										
			IRON	NA	NA	NA	0.0E+00	Blood, Gastrointestinal, Liver	1.3E-01	NA	5.1E-03	1.3E-01
			VANADIUM	NA	NA	NA	0.0E+00	Kidney	6.2E-02	NA	9.5E-02	1.6E-01
Chemical Total				0.0E+00	0.0E+00	0.0E+00	0.0E+00		1.9E-01	0.0E+00	1.0E-01	2.9E-01
Medium Total							0.0E+00					2.9E-01
Groundwater	Groundwater	Tap Water										
			Perchlorate	NA	NA	NA	0.0E+00	Thyroid	1.2E+01	NA	6.1E-08	1.2E+01
			ANTIMONY	NA	NA	NA	0.0E+00	Blood	7.1E+00	NA	2.5E-07	7.1E+00
			ARSENIC	1.1E-03	NA	5.6E-12	1.1E-03	Skin, Vascular	7.0E+00	NA	3.7E-08	7.0E+00
			BARIUM	NA	NA	NA	0.0E+00	NOAEL	1.9E-01	NA	1.4E-08	1.9E-01
			CADMIUM	NA	NA	NA	0.0E+00	Kidney	4.9E-01	NA	1.0E-07	4.9E-01
			CHROMIUM, TOTAL	NA	NA	NA	0.0E+00	NOAEL	3.0E-01	NA	1.3E-07	3.0E-01
			IRON	NA	NA	NA	0.0E+00	Blood, Gastrointestinal, Liver	5.6E-01	NA	2.9E-09	5.6E-01
			MANGANESE	NA	NA	NA	0.0E+00	CNS	1.2E+01	NA	2.3E-07	1.2E+01
			SELENIUM	NA	NA	NA	0.0E+00	Whole Body	7.3E-01	NA	3.8E-09	7.3E-01
			SILVER	NA	NA	NA	0.0E+00	Skin	3.1E-01	NA	2.4E-08	3.1E-01
			THALLIUM	NA	NA	NA	0.0E+00	Kidney	2.1E+01	NA	1.1E-07	2.1E+01
Chemical Total				1.1E-03	0.0E+00	5.6E-12	1.1E-03		6.1E+01	NA	9.5E-07	6.1E+01
Medium Total							1.1E-03					6.1E+01
Receptor Total							1.1E-03				Receptor HI Total	6.1E+01

HI - Hazard Index

CNS - Central Nervous System

NOAEL = No Observed Adverse Effects Level

Total CNS HI Across All Media =	1.2E+01
Total Skin HI Across All Media =	7.3E+00
Total Vascular HI Across All Media =	7.0E+00
Total Kidney HI Across All Media =	2.1E+01
Total NOAEL HI Across All Media =	4.9E-01
Total Gastrointestinal HI Across All Media =	6.9E-01
Total Blood HI Across All Media =	7.8E+00
Total Liver HI Across All Media =	6.9E-01
Total Thyroid HI Across All Media =	1.2E+01
Total Whole Body HI Across All Media =	7.3E-01

TABLE 10.5.RME
RISK SUMMARY
REASONABLE MAXIMUM EXPOSURE
SWMU 6 - Mangrove Disposal Site
NASD, Vieques Island, Puerto Rico

Scenario Timeframe: Future
Receptor Population: Residential
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk				Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Surface Soil	Surface Soil	SWMU 6 Surface Soil										
			ALUMINUM	NA	NA	NA	0.0E+00	CNS	1.1E-01	4.2E-03	3.1E-03	1.2E-01
			ARSENIC	5.8E-06	3.7E-08	4.8E-07	6.3E-06	Skin, Vascular	1.5E-01	NA	1.3E-02	1.6E-01
			CHROMIUM, TOTAL	NA	5.5E-07	NA	5.5E-07	NOAEL	7.9E-02	9.2E-07	8.9E-02	1.7E-01
			IRON	NA	NA	NA	0.0E+00	Blood, Gastrointestinal, Liver	1.2E+00	NA	3.3E-02	1.2E+00
			THALLIUM	NA	NA	NA	0.0E+00	Liver, Blood, Hair	1.8E-01	NA	5.2E-03	1.9E-01
			VANADIUM	NA	NA	NA	0.0E+00	Kidney	5.8E-01	NA	6.2E-01	1.2E+00
Chemical Total				5.8E-06	5.9E-07	4.8E-07	6.8E-06		2.3E+00	4.2E-03	7.7E-01	3.1E+00
Medium Total							6.8E-06					3.1E+00
Groundwater	Groundwater	Tap Water										
			Perchlorate	NA	NA	NA	0.0E+00	Thyroid	2.7E+01	NA	1.8E-07	2.7E+01
			ANTIMONY	NA	NA	NA	0.0E+00	Blood	1.7E+01	NA	7.3E-07	1.7E+01
			ARSENIC	6.3E-04	NA	4.2E-12	6.3E-04	Skin, Vascular	1.6E+01	NA	1.1E-07	1.6E+01
			BARIUM	NA	NA	NA	0.0E+00	NOAEL	4.3E-01	NA	4.1E-08	4.3E-01
			CADMIUM	NA	NA	NA	0.0E+00	Kidney	1.2E+00	NA	3.0E-07	1.2E+00
			CHROMIUM, TOTAL	NA	NA	NA	0.0E+00	NOAEL	7.1E-01	NA	3.7E-07	7.1E-01
			IRON	NA	NA	NA	0.0E+00	Blood, Gastrointestinal, Liver	1.3E+00	NA	8.6E-09	1.3E+00
			MANGANESE	NA	NA	NA	0.0E+00	CNS	2.8E+01	NA	6.6E-07	2.8E+01
			SELENIUM	NA	NA	NA	0.0E+00	Whole Body	1.7E+00	NA	1.1E-08	1.7E+00
			SILVER	NA	NA	NA	0.0E+00	Skin	7.2E-01	NA	7.1E-08	7.2E-01
			THALLIUM	NA	NA	NA	0.0E+00	Kidney	4.8E+01	NA	3.2E-07	4.8E+01
Chemical Total				6.3E-04	0.0E+00	4.2E-12	6.3E-04		1.4E+02	NA	2.8E-06	1.4E+02
Medium Total							6.3E-04					1.4E+02
Receptor Total							6.4E-04				Receptor HI Total	1.5E+02

HI - Hazard Index
CNS - Central Nervous System
NOAEL = No Observed Adverse Effects Level

Total CNS HI Across All Media =	2.8E+01
Total Skin HI Across All Media =	1.7E+01
Total Vascular HI Across All Media =	1.7E+01
Total Kidney HI Across All Media =	5.1E+01
Total NOAEL HI Across All Media =	1.3E+00
Total Gastrointestinal HI Across All Media =	2.5E+00
Total Blood HI Across All Media =	1.9E+01
Total Liver HI Across All Media =	2.7E+00
Total Hair HI Across All Media =	1.9E-01
Total Thyroid HI Across All Media =	2.7E+01
Total Whole Body HI Across All Media =	1.7E+00

TABLE 10.6.RME
RISK SUMMARY
REASONABLE MAXIMUM EXPOSURE
SWMU 6 - Mangrove Disposal Site
NASD, Vieques Island, Puerto Rico

Scenario Timeframe: Future
Receptor Population: Industrial Worker
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk				Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Surface Soil	Surface Soil	SWMU 6 Surface Soil	VANADIUM	NA	NA	NA	0.0E+00	Kidney	4.4E-02	NA	1.1E-01	1.6E-01
Chemical Total				0.0E+00	0.0E+00	0.0E+00	0.0E+00		4.4E-02	0.0E+00	1.1E-01	1.6E-01
Medium Total							0.0E+00					1.6E-01
Groundwater	Groundwater	Tap Water	Perchlorate	NA	NA	NA	0.0E+00	Thyroid	4.2E+00	NA	0.0E+00	4.2E+00
			ANTIMONY	NA	NA	NA	0.0E+00	Blood	2.5E+00	NA	4.2E-10	2.5E+00
			ARSENIC	4.0E-04	NA	3.3E-13	4.0E-04	Skin, Vascular	2.5E+00	NA	1.3E-11	2.5E+00
			CADMIUM	NA	NA	NA	0.0E+00	Kidney	1.8E-01	NA	4.4E-11	1.8E-01
			CHROMIUM, TOTAL	NA	NA	NA	0.0E+00	NOAEL	1.1E-01	NA	2.0E-08	1.1E-01
			IRON	NA	NA	NA	0.0E+00	Blood, Gastrointestinal, Liver	2.0E-01	NA	1.3E-09	2.0E-01
			MANGANESE	NA	NA	NA	0.0E+00	CNS	4.3E+00	NA	1.3E-08	4.3E+00
			SELENIUM	NA	NA	NA	0.0E+00	Whole Body	2.6E-01	NA	1.3E-14	2.6E-01
			SILVER	NA	NA	NA	0.0E+00	Skin	1.1E-01	NA	0.0E+00	1.1E-01
			THALLIUM	NA	NA	NA	0.0E+00	Kidney	7.4E+00	NA	6.1E-10	7.4E+00
Chemical Total				4.0E-04	0.0E+00	3.3E-13	4.0E-04		2.2E+01	NA	3.5E-08	2.2E+01
Medium Total							4.0E-04					2.2E+01
Receptor Total							4.0E-04				Receptor HI Total	2.2E+01

HI - Hazard Index
CNS - Central Nervous System
NOAEL = No Observed Adverse Effects Level

Total CNS HI Across All Media =	4.3E+00
Total Skin HI Across All Media =	2.6E+00
Total Vascular HI Across All Media =	2.5E+00
Total Kidney HI Across All Media =	7.7E+00
Total NOAEL HI Across All Media =	1.1E-01
Total Gastrointestinal HI Across All Media =	2.0E-01
Total Blood HI Across All Media =	2.7E+00
Total Liver HI Across All Media =	2.0E-01
Total Thyroid HI Across All Media =	4.2E+00
Total Whole Body HI Across All Media =	2.6E-01

ATTACHMENT 2

Review of "Contaminant Levels in Crabs from Two Solid Waste Management Units on Vieques National Wildlife Refuge"

PREPARED FOR:

PREPARED BY: CH2M HILL

DATE: April 22, 2004

The subject report provides the results of chemical tissue analyses for land crabs and fiddler crabs collected by the US Department of Interior (USDOI, 2002) from two Solid Waste Management Units (SWMUs) on Vieques Island. The report also provides a very qualitative evaluation of potential ecological effects associated with detected chemicals from these samples. There are, however, important factors to consider when drawing conclusions about potential risks to wildlife using the tissue data collected by USDOI. This Technical Memorandum discusses key issues related to the crab tissue data and the risk conclusions from the USDOI report.

Study Overview

The USDOI collected crab samples from two SWMUs on Vieques Island. SWMU 6 is the Mangrove Disposal Site from which two individual land crab (*Cardisoma quanhumi*) samples and one composite fiddler crab (*Uca* sp.) sample were collected. These samples were identified as SWMU6-1, SWMU6-2, and SWMU6-3, respectively. SWMU 4 is the Open Burn/Open Detonation Site from which two individual land crab samples and one composite fiddler crab sample were also collected. These samples were identified as SWMU4-1, SWMU4-2, and SWMU4-3, respectively.

Sandy Point National Wildlife Refuge in St. Croix, USVI, was used as a reference location from which three individual land crab samples were collected. Since this reference location is not from Vieques Island, its applicability as a reference for SWMUs on Vieques Island is limited. In addition, no reference fiddler crab samples were collected.

Crabs were analyzed as whole body samples, which is appropriate for the evaluation of potential risk to wildlife which could consume these crab species. Chemical parameters analyzed included metals, pesticides, and PCBs. As a note, an evaluation of potential human health risks cannot be accurately conducted with these crab samples since the edible crab tissue was not isolated for analysis.

Study Limitations

The following summarizes the key limitations of the USDOI report:

1. The limited applicability of the reference location.
2. The low samples sizes.
3. The lack of location-specific information on where samples were collected, which does not allow an evaluation of their representativeness.
4. The lack of co-located media concentrations to put the data in perspective (i.e., are these tissue data from the most contaminated portion of the site, the least, somewhere in between?).
5. Lack of context in the form of a conceptual site model of exposures. For example, there is no discussion on the home range of the crab species relative to the site size, the areas of the SWMUs with elevated chemical concentrations, the locations of the crab tissue samples, and what specific wildlife receptors would forage on crabs at the sites.
6. The limited and unreferenced "effects" assessment, which does not focus on the key receptors and pathways. Also, no attempt to put the tissue residues in perspective (except for the reference site comparison, which has limited applicability due to the distant location of the reference site) in terms of potential effects to the crabs themselves (i.e., comparison to applicable tissue residue effect levels from the literature).
7. The end result is that the USDOI conclusions are unsupported. While the data show that the crabs are exposed to site-related chemicals, it does not provide the information and analysis to show that these exposures result in unacceptable risks to the crabs or the receptors that feed upon them.

Wildlife Receptors

There are important life history characteristics of land crabs that reduce exposure to higher food chain wildlife. Many of these characteristics serve to minimize predation: (1) they live in burrows that up to 5 feet deep and thus are protected from most land predators, (2) peak activity is only at dawn and dusk therefore minimizing exposure beyond the burrow entrance, and (3) the crabs are large (up to 6 inches and 1 pound in weight) and protected by an exoskeleton, thus reducing the number of predators capable of capturing and consuming this species. Land crabs are vegetarians, preferentially eating mangrove leaves, fruits and grasses collected near the burrow, and combined with a the exoskeleton have restricted direct exposure to soil contaminants. Contaminant uptake is most likely to occur through the gills which are kept wet through contact with water within the burrow.

Fiddler crabs can be very abundant at these sites, and although protected by living within burrows, they can be active during the daytime and are small (up to 1 inch), making them easier targets for predators. Fiddler crabs are detritivores which feed by scrubbing organic matter from muddy particles in the soil or sediment, therefore exposure to contaminants is likely to occur through direct ingestion of soil, as well as through exposure of the gills to water in their burrows.

The USDOI report indicates that because SWMU 6 is located in an estuarine mangrove environment, there exists a pathway to larger predator species such as herons and egrets. In addition, it was stated that the entire Kiani Lagoon area is host to numerous herons and

egrets including night herons and pelicans, all of which feed exclusively on crabs and fish. A variety of semi-aquatic birds does exist throughout the lagoon area which includes SWMU 6, however the exposure pathway from land crabs and fiddler crabs to most of the bird species described by USDOI is limited for the following reasons:

- **SWMU 6 Habitat Conditions –** The habitat condition within the boundary of SWMU 6 is predominantly terrestrial. A shallow earthen berm exists along the north and western edges of the site which prevents high tide events from inundating the site. The berm was historically created to facilitate the use of the area for solid waste dumping. Although land crabs, and to a greater extent fiddler crabs, are common across most of the site, the surface hydrology is controlled by the perimeter berm so that the entire site is typically exposed soil. The groundwater table across the site however is very shallow, thus soils are typically saturated and supportive of land crabs and fiddler crabs which require a water source in their subsurface burrows. The terrestrial conditions of the site are generally not supportive of semi-aquatic birds such as herons which would more likely forage for fish and invertebrates in the adjacent lagoon system.

- **Bird Dietary Preferences** - The pelicans, herons, and egrets referred to by USDOI predominantly feed on fish, with invertebrates such as crabs as a small portion of their diet. For example, the brown pelican feeds almost entirely on fish and forages almost exclusively in open water. The pelican would not be expected to feed on crabs directly on SWMU 6. Most semi-aquatic birds that occur near SWMU 6 forage in aquatic systems and feed primarily on fish. Examples include resident birds such as the snowy egret, little blue heron, tricolored heron, green heron, reddish egret, great egret, and osprey. The great blue heron is an example of a wading bird that feeds primarily on fish but the foraging habitat may include aquatic and terrestrial areas. The yellow-crowned night heron is an exception since it does feed heavily on crustaceans, mostly along waterways but occasionally in upland areas. In summary, although a wide variety of semi-aquatic bird species occur near SWMU 6, dietary and habitat requirements limit the consumption of crabs from the site to only a few bird species, none of which however would forage exclusively within the boundary of SWMU 6.

- **Small Site Size** - The area of solid waste disposal at SWMU 6 is approximately 1 acre. This area is smaller than the home range for any of these semi-aquatic bird species described earlier. As a result, this site would represent a fraction of the total foraging area for these bird species. In addition, areas of elevated chemical concentrations are spatially restricted at the site since they are associated with small piles of solid waste debris. Considering the optimum open water and shoreline habitats throughout the Kiani Lagoon system adjacent to the site, and the terrestrial habitat conditions on the SWMU 6 site, foraging activities by semi-aquatic birds at SWMU 6 are expected to be low.

- **Limited Land Crab Predation** -Land crabs are very large, hard shelled, are protected by burrows, and have limited periods of activity outside the burrow. Given these characteristics, land crabs are expected to be difficult to consume for most birds, and for a large species such as the great blue heron, may only be consumed occasionally. As a result, consumption of land crabs by birds is likely to be low. Consumption of fiddler

crabs is more likely due to their small size, daytime activity, and greater abundance onsite.

Crab Sample Size

The very low number of tissue samples collected by USDOI (2 land crab and one fiddler crab sample from each SWMU) is unlikely to accurately represent site-wide tissue concentrations, especially since it is not reported where onsite the tissues were collected. The tissue data may be skewed towards the areas of high soil concentrations and thus be conservative, or towards areas with lower concentrations and thus may undestimate exposures. Variation in tissue concentrations across the site, or even within the same species, cannot be evaluated. A minimum of 10 samples of each species should have been collected from throughout each site to allow adequate representation and statistical evaluations of the data.

Crab Data Risk Characterization

CH2M HILL has conducted a complete screening ecological risk assessment (SERA) for SWMU 6 in accordance with Navy and EPA guidance, as presented in the SWMU 6 RFI. Data and methods used in the SERA were used to support this evaluation of the USDOI crab tissue data.

Since the focus of the USDOI study was on the concentration of contaminants in crabs found onsite, it will be conservatively assumed in the exposure characterization that crabs make up the entire dietary composition of birds foraging onsite. Representative bird receptors include the green heron, yellow-crowned night heron, and the great blue heron to evaluate exposures to a range of small to large wading bird species that may consume invertebrates from SWMU 6. Contaminants of concern are those identified by USDOI and include DDE, DDT, cadmium, lead, and vanadium.

Ingestion screening values for dietary exposures were identified for the great blue heron, green heron, and yellow-crowned night heron. Toxicological information from the literature for wildlife species most closely related to these receptor species was used. No Observed Adverse Effect Levels (NOAELs) based on growth and reproduction were utilized as the primary screening values.

For this evaluation, a food web model was used to back-calculate the tissue concentrations (mg/kg) in crabs that would result in an exposure equivalent to the NOAEL. Thus, maximum crab tissue concentrations that would pose no adverse effect to the great blue heron, green heron, and yellow-crowned heron were calculated and are shown in Table 1.

As illustrated in Table 1, none of the measured tissue concentrations, either in land crabs or fiddler crabs, exceeded concentrations that would pose an unacceptable risk to the great blue heron, green heron, or yellow-crowned heron. The exposure model used to calculate the no effect crab tissue concentrations conservatively assumed that crabs comprised 100 percent of the birds diet.

Table 1. Comparison of Measured Crab Tissue Concentrations No Effect Concentrations for Birds

	Measured Concentration in USDOI Study (mg/kg dry wt.)			Maximum No Effect Crab Concentration (mg/kg dry wt.)		
Chemical	**SWMU6-1 (Land Crab 1)**	**SWMU6-2 (Land Crab 2)**	**SWMU6-3 (Fiddler Crab composite)**	**Great Blue Heron**	**Green Heron**	**Yellow-crowned Night Heron**
Pesticides						
DDE	0.52	ND	0.178	1.44	1.03	1.48
DDT	0.112	ND	ND	1.44	1.03	1.48
Metals						
Cadmium	1.6	0.0881	1.00	6.95	5	7.2
Lead	4.99	0.679	11.7	18.5	13.3	19
Vanadium	1.56	1.04	2.63	54.5	39.5	56.5
	ND = not detected.					

Summary

The USDOI collected two individual land crab (*Cardisoma quanhumi*) samples and one composite fiddler crab (*Uca* sp.) sample from SWMU 6, the Mangrove Disposal Site. Sample locations however were not documented. The collection of these few samples is likely to be insufficient to adequately represent invertebrate tissue concentrations at the site, and standard ERA guidance by the Navy or EPA was apparently not considered in the study design (i.e., a conceptual site model was not developed). Crabs were analyzed as whole body samples, which is appropriate for the evaluation of potential risk to wildlife.

Chemical parameters analyzed in the three tissue samples included PCBs, pesticides, and metals. PCBs were not detected in the crab tissues. DDT was detected in one sample, DDE was detected in two samples, and DDD was not detected in any sample. USDOI identified cadmium, lead, and vanadium as exceeding reference crab tissue concentrations, although the referenced area used was geographically inappropriate.

The USDOI apparent purpose for the crab tissue sampling was a concern that wildlife resources may be impacted by the presence of site-related contaminants. However, crab tissue samples were collected without a clear understanding of how land and fiddler crabs are exposed to site contaminants, how they fit into the food chain of the site, and what wildlife species would actually consume these invertebrates. For example, land crabs remain in their deep burrows most of the day, are too large to be substantially consumed by most bird species near the site, and overall would have a minimal contribution to the local food chain.

Other factors which limit exposure of crabs to birds near SWMU 6 include the terrestrial conditions of the site that would not provide optimal habitat for most of the semi-aquatic bird species that feed on invertebrates, the predominant dietary component of most of the birds is fish, and the site which is 1-acre in size would support a fraction of the total foraging area for the birds.

A conservative back-calculation using the food web model from the SWMU 6 ERA (contained in the RFI report) indicates that the chemical concentrations measured by USDOI in the crabs are below concentrations at which adverse effects may occur to predatory birds. Therefore, despite the technical issues and uncertainties with the crab tissue samples, concentrations detected in the crab tissues are not at levels that would pose an unacceptable risk to birds foraging at the site.

USDOI, 2002. Contaminant Levels in Crabs from Two Solid Waste Management Units on Vieques National Wildlife Refuge. Department of the Interior, US Fish and Wildlife Service, Caribbean Field Office. Report Number R4PRFO-02-01. October 4, 2002. Regional Id VINWR.

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April 21, 2003

Michael Sivak
U.S. EPA - Region II

ASSISTANCE REQUESTED: Requested toxicity information on Aluminum and Iron. *(Vieques)*

ENCLOSED INFORMATION:

Attachment 1: **Risk Assessment Issue Paper for: Evaluating the Carcinogenicity of Aluminum (CASRN 7429-90-5)**

Attachment 2: **Risk Assessment Issue Paper for: Derivation of a Provisional Inhalation RfC for Aluminum (CASRN 7429-90-5)**

Attachment 3: **Risk Assessment Issue Paper for: Derivation of a Provisional Oral RfD for Aluminum (CASRN 7429-90-5)**

Attachment 4: **Risk Assessment Issue Paper for: Evaluation of the Carcinogenicity Assessment for Iron (CASRN 7439-89-6) and Compounds**

Attachment 5: **Risk Assessment Issue Paper for: Feasibility of Deriving a Provisional RfC for Iron (CASRN 7439-89-6)and Compounds**

Attachment 6: **Risk Assessment Issue Paper for: Derivation of the Provisional RfD for Iron (CASRN 7439-89-6) and Compounds**

BE ADVISED: *Unless specifically indicated to have been peer reviewed, it is to be noted that the attached Risk Assessment Issue Paper(s) have not been through the U.S. EPA's formal review process; therefore, they do not represent a U.S. EPA verified assessment.*

If you have any questions regarding this transmission, please contact the STSC at (513) 569-7300.

Attachments (6)

cc: STSC files

Supported by IntelliTech Systems, Incorporated, under
U.S. Environmental Protection Agency Contract No. 68-C-01-147.

Risk Assessment Issue Paper for: Evaluating the Carcinogenicity of Aluminum (CASRN 7429-90-5)

NOTE: This provisional risk assessment paper for the carcinogenicity for Aluminum has received external peer review.

INTRODUCTION

Verified toxicity values for aluminum (Al) and its compounds are unavailable on IRIS or HEAST (U.S. EPA, 1999, 1997), except for a chronic oral RfD of 4E-4 mg/kg-day for aluminum phosphide. However, occupational guidelines and standards have been established for a number of chemical and physical forms of Al, including, from ACGIH, 8-hour TWA-TLVs of 10 mg/m^3 for the compound as a metal dust or oxide, 5 mg/m^3 as "pyro" powders or welding fumes, and 2 mg/m^3 for soluble salts or organic forms of the metal (ACGIH, 1998). From NIOSH, 10-hour TWA-RELs of 10 mg/m^3 are specified for "total" Al dust versus 5 mg/m^3 for the respirable portion (NIOSH, 1994), the institute covers all other forms of the metal by identical values to those specified by ACGIH (ACGIH, 1998). OSHA PELs for Al include an 8-hour TWA value of 15 mg/m^3 for "total" metal dust, versus 5 mg/m^3 for the respirable portion (NIOSH, 1994). The U.S. EPA's CARA list (U.S. EPA, 1994) cites a HEA for Al (U.S. EPA, 1987), and ATSDR has updated its toxicological profile of the element (ATSDR, 1998).

Research papers pertinent to the potential carcinogenic effects of Al were sought through computer searches of the HSDB, RTECS, MEDLINE, and TOXLINE (and its subfiles) databases, covering the time period 1995-1999. The literature searches were conducted in June, 1999.

REVIEW OF THE PERTINENT LITERATURE

The review by Stokinger (1981) gives an account of Al as an all-pervasive component of products that are central to the daily lives of most Americans. For example, the metal is a crucial part of manufactured products for the building, automobile, and container industries, while Al as powder or flake is a component in a number of consumer products, such as paints, fireworks, etc. Al complexes and minerals are used in the brewing and paper industries, and as coagulants for water purification. Al oxide finds application in abrasives, as a catalyst or absorbent, and as a component in fillers. Al chloride is included in cosmetic formulations such as deodorants.

Human exposure to Al arises principally from food, through its widespread use in food additives, packaging and cooking utensils, and in Al-containing medications, particularly antacid, buffered aspirin, anti-ulcer and anti-diarrheal formulations (Marquis, 1989; Lione, 1985). Pennington and Schoen (1995) estimated daily Al intakes of 0.1-0.3 mg/kg-day for infants and children 6 months-6 years of age and 0.1-0.18 mg/kg-day for older children and adults, data are in broad agreement with those of Wilhelm et al. (1995) who reported the dietary intake of Al in German children (living in the Duisberg area) as ranging from 0.008 to 0.11 mg Al/kg-day. These values are consistent with a range of 1-20 mg/day (0.014-0.3 mg/kg-day) for normal oral daily Al intake from food and water reported by other investigators (Ganrot, 1986; Iyengar et al., 1987; Wilhelm et al., 1990). However, users of Al-containing medications can ingest much larger amounts of the element, possibly

as high as 840-5000 mg/day (12-71 mg/kg-day) from antacids, 126-728 mg/day (1.8-10.4 mg/kg-day) from buffered aspirins and 828 mg/day (11.8 mg/kg-day) from anti-ulcer compounds when taken at recommended dosages (Lione, 1985).

There is a large amount of information available on the absorption, transfer from tissue to tissue and elimination of Al from the body, including data that have been amassed from studies on either human volunteers or laboratory animals. In general, the chemical appears to be poorly absorbed from the gastrointestinal tract, though the portion of the load that is retained will vary depending on the concentration, the chemical species administered, the fasting or fed state of the host, gastrointestinal pH, animal model, etc. For example, Yokel and McNamara (1988) administered single oral doses of a number of Al compounds (both water soluble and insoluble) to New Zealand white rabbits and obtained absorbed proportions of the load ranging from 0.27% to 27%. Fractional uptake of Al in humans under normal conditions (i.e., with no intake of large quantities of Al from medicine) was estimated to be 0.1-0.3% assuming an intake of 20 mg Al/day (0.3 mg Al/kg-day) and urinary excretion of 20-50 : g Al/day (0.3-0.7 : g Al/kg-day) (Ganrot, 1986). However, little information is available on the actual mechanism by which the element and its compounds are transported across the brush border. (Wilhelm et al., 1990; Lione et al., 1985).

Aluminum can also be absorbed by inhalation as indicated by age-related deposition in the lungs of the general population and exposure-related increased blood and urine concentrations in workers exposed to aluminum (Bast-Pettersen et al., 1994; Sjogren et al., 1996; Hosovski et al., 1990; Wilhelm et al., 1990; U.S. EPA, 1987). Aluminum occurs primarily in particulate form in the ambient atmosphere and as various dusts and fumes during its production and use. Common forms of inhaled aluminum include aluminum oxide (alumina; Al_2O_3), pyro powders (powder and flake aluminum treated to reduce surface oxidation), aluminum welding fume, and soluble salts (e.g., aluminum chloride and sulfate) (ACGIH, 1991).

There are a number of published reports of studies in which the carcinogenicity of aluminum compounds has been evaluated. These include oral exposure studies in which the compounds were made available to experimental animals in the drinking water or diet (Schroeder and Mitchener, 1975a,b: Oneda et al, 1994), and inhalation epidemiological studies, in which the incidence of tumor formation in persons exposed to aluminum-containing dusts and fumes in an occupational setting was compared to unexposed individuals (Spinelli et al., 1991; Theriault et al., 1984, 1990; Armstrong et al., 1986; Tremblay et al., 1995; Selden et al., 1997; Cullen et al., 1996; Dufresne et al., 1996; Ronneberg and Langmark, 1992). As discussed in the following paragraphs, solid evidence for a positive carcinogenic effect of Al has not emerged from the subject studies, thereby leaving the issue of the potential carcinogenicity of the Al compounds still in doubt.

Oral Exposure

Schroeder and Mitchener (1975a) exposed 52 Long-Evans rats/sex/group to 0 or 5 ppm Al as potassium minum sulfate in drinking water for life. Based on default values for drinking water consumption and body ..eight for this strain of rat in a chronic study (U.S. EPA, 1988), these values are equivalent to Al doses of 0.472 and 0.67 mg/kg-day, for males and females, respectively. Study endpoints included body and heart weight; serum glucose, cholesterol, and uric acid; and urinary protein, glucose, and pH. All animals were necropsied at the time of natural death, and histological examinations were carried out on heart, lung, kidney, liver, spleen and gross tumors, for approximately 50% of the animals in the group. The only remarkable finding was a significant increase ($p<0.005$) in gross tumor incidence in exposed male rats [13/25 (52%) compared to 4/26 (15%) in controls], although the tumor sites were not reported. Six of the tumors in the exposed males (46% of total) were considered malignant compared to two malignant tumors (50% of total) in the male controls. There were no significant differences in tumor incidences between exposed and control females.

In another study by the same investigators, 54 Swiss mice/sex/group were exposed to drinking water containing 0 or 5 ppm Al as aluminum potassium sulfate for life (Schroeder and Mitchener, 1975b). Based on default values for drinking water consumption and body weight for B6C3F1 mice in a chronic study (U.S. EPA, 1988), these values approximate to Al doses of 1.2 mg/kg-day in both males and females. Study endpoints included body weight, gross pathology, and some limited histology of the heart, lung, liver, kidney, and spleen. The incidences of gross tumors were 15/41 (36.6%) and 11/38 (28.9%) in exposed and control males, respectively, and 19/41 (46.3%) and 14/47 (29.8%) in exposed and control females, respectively, differences that did not achieve statistical significance by Fisher's exact test, although incidences of multiple tumors and lymphoma leukemia were considered by the authors to be significantly increased in females ($p<0.025$ and $p<0.05$, respectively). However, a definitive assessment of aluminum carcinogenicity in both this and the rat udy (Schroeder and Mitchener, 1975a) is precluded by the limitations of the pathology examinations and orting.

In a more recent study, the tumorigenic potential of aluminum potassium sulfate was assessed in B6C3F1 mice chronically exposed in the diet (Oneda et al., 1994). Sixty animals/sex/group were fed a diet containing 0, 1.0, 2.5, 5.0, or 10.0% (w/w) for 20 months. These concentrations of aluminum potassium sulfate (as the dodecahydrate) are equivalent to 0, 569, 1422, 2844, and 5687 ppm Al. Using food factors calculated with an algorithm relating food consumption to body weight (U.S. EPA, 1988) and body weight data estimated from growth curves reported by the investigators, the dosages of aluminum are estimated to be 0, 95, 237, 483, or 1024 mg Al/kg-day in males and 0, 97, 242, 512, or 1110 mg Al/kg-day in females. Clinical signs, food consumption, and body weight were evaluated weekly. Hematology, clinical chemistry, or urine endpoints were not assessed. Necropsies that included organ weight measurements and comprehensive histological examinations (including brain) were performed on all animals, including those that died during the course of the study. Survival rates were higher than control values in all treated male and female groups, ranging from 86.7-95.0% compared to 73.3% in males and 86.7-91.7% compared to 78.3% in females. No changes in food consumption were observed, but body weight gain was increased in both sexes at 95-97 and 237-242 mg Al/kg-day (weights were 10-23% higher than controls at end of study), was similar to controls in both sexes at 483-512 mg Al/kg-day, and decreased in both sexes at 1024-1110 mg Al/kg-day (11-16% lower than controls at end of study). There were no exposure-related increased incidences of tumors, other proliferative lesions, or non-neoplastic lesions. In fact, the incidence of spontaneous hepatocellular carcinomas was significantly decreased in males at 1024 mg Al/kg-day (5.5% compared to 20.5% in controls, $p<0.01$).

Inhalation Exposure

A body of epidemiological evidence has pointed to an increased incidence of cancers of various kinds in workers employed in the aluminum production industry. However, as discussed in a review by Ronneberg and Langmark (1992), the concern about potential cancer hazards in the aluminum industry has primarily arisen because of exposures to polycyclic aromatic hydrocarbons (PAHs) and coal tar pitch volatiles (CTPVs) rather than to Al *per se*. Thus, while a number of studies have provided inferential data linking occupationally exposed aluminum workers with an increased risk of developing tumors of the bladder or lung (Gibbs, 1985; Thériault et al., 1984, 1990; Armstrong et al., 1986; Spinelli et al., 1991; Pearson et al., 1993; Tremblay et al., 1995), it would be unwise to ascribe any excess tumor formation to the effects of Al in view of the concurrent exposure to well-documented carcinogenic PAHs such as benzo(a)pyrene. The issue is further complicated by the likely exposure of production workers to other substances such as fluorides, sulfur dioxide, aromatic amines and asbestos (Ronneberg and Langmark, 1992; Tremblay et al., 1995; Dufresne et al., 1996), and to the possible effects of cigarette smoking in affected individuals. Consequently, these studies have failed to provide direct evidence for the carcinogenicity of Al fumes and dusts.

WEIGHT-OF-EVIDENCE CLASSIFICATION

A considerable number of epidemiological studies have examined the incidence of excess tumor formation in persons occupationally exposed to Al in the form of dusts or fumes. In general, a body of inferential evidence exists for an increase in cancer of the bladder and lung through such occupational exposure to Al, although conclusions linking these responses to the effects of Al are confounded by attendant co-exposure to other harmful emissions such as PAHs, CTPVs, and by cigarette smoking. A 20-month exposure of B6C3F1 mice to Al potassium sulfate dodecahydrate in the diet at concentrations up to 10% w/w displayed no indication of compound-related carcinogenicity and, in general, no indication of adverse toxicological effects of any kind (Oneda et al., 1994). Similarly, the life-time exposure of Swiss mice and Long-Evans rats to 5 ppm Al as aluminum potassium sulfate in drinking water provided no convincing evidence for the carcinogenicity of Al compounds (Schroeder and Mitchener 1975a,b). Gene reversion experiments on Al compounds resulted in negative results in *S. typhimurium* (Ahn and Jeffrey, 1994). Taking all of the evidence of Al carcinogenicity together, a qualitative weight-of evidence classification of D, -not classifiable as to human carcinogenicity, is suggested, in line with the agency's guidelines for carcinogenic risk assessment (U.S. EPA, 1986). In accordance with the agency's proposed guidelines for carcinogenic risk assessment (U.S. EPA, 1996), the compound's carcinogenicity *cannot be determined* on the available evidence.

DERIVATION OF AN ORAL SLOPE FACTOR AND INHALATION UNIT RISK

Due to insufficeint data a provisional oral slope factor and inhalation unit risk could not de developed.

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Risk Assessment Issue Paper for:
Derivation of a Provisional Inhalation RfC for Aluminum (CASRN 7429-90-5)

NOTE: This provisional risk assessment paper for the inhalation chronic reference concentration (RfC) for Aluminum has received external peer review.

INTRODUCTION

Verified toxicity values for aluminum (Al) and its compounds are unavailable on IRIS or HEAST (U.S. EPA, 1999, 1997), except for a chronic oral RfD of 4E-4 mg/kg-day for aluminum phosphide. However, occupational guidelines and standards have been established for a number of chemical and physical forms of Al, including, from ACGIH, 8-hour TWA-TLVs of 10 mg/m^3 for the compound as a metal dust or oxide, 5 mg/m^3 as "pyro" powders or welding fumes, and 2 mg/m^3 for soluble salts or organic forms of the metal (ACGIH, 1998). From NIOSH, 10-hour TWA-RELs of 10 mg/m^3 are specified for "total" Al dust versus 5 mg/m^3 for the respirable portion (NIOSH, 1994), NIOSH covers all other forms of the metal by identical values to those specified by ACGIH (ACGIH, 1998). OSHA PELs for Al include an 8-hour TWA value of 15 mg/m^3 for "total" metal dust, versus 5 mg/m^3 for the respirable portion (NIOSH, 1994). The U.S. EPA's CARA list (U.S. EPA, 1994) cites a HEA for Al (U.S. EPA, 1987), and ATSDR has updated its toxicological profile of the element (ATSDR, 1998).

Research papers pertinent to the potential toxicological effects of Al via the inhalation route were sought through computer searches of the HSDB, RTECS, MEDLINE, and TOXLINE (and its subfiles) databases, covering the time period 1995-1999. The literature searches were conducted in June, 1999.

REVIEW OF THE PERTINENT LITERATURE

The review by Stokinger (1981) gives an account of Al as an all-pervasive component of products that are central to the daily lives of most Americans. For example, the metal is a crucial part of manufactured products for the building, automobile, and container industries, while Al as powder or flake is a component in a number of consumer products, such as paints, fireworks, etc. Al complexes and minerals are used in the brewing and paper industries, and as coagulants for water purification. Al oxide finds application in abrasives, as a catalyst or absorbent, and as a component in fillers. Aluminum chloride is included in cosmetic formulations such as deodorants.

Human exposure to Al arises principally from food, through its widespread use in food additives, packaging and cooking utensils, and in Al-containing medications, particularly antacids, buffered aspirin, anti-ulcer and anti-diarrheal formulations (Marquis, 1989; Lione, 1985). Pennington and Schoen (1995) estimated daily Al intakes of 0.1-0.3 mg/kg-day for infants and children 6 months-6 years of age and 0.1-0.18 mg/kg-day for older children and adults, based on the FDA Total Diet Study (1993) and the U.S. Department of Agriculture Nationwide Food Consumption Survey (1987-1988). These data are in broad agreement with those of Wilhelm et al. (1995) who reported the dietary intake of Al in German children (living in the Duisberg area) as ranging from 0.008 to 0.11 mg Al/kg-day. These values are consistent with a range of 1-20 mg/day (0.014-0.3 mg/kg -day) for normal oral daily Al intake from food and water reported by other investigators (Ganrot,

1986; Iyengar et al., 1987; Wilhelm et al., 1990). However, users of Al-containing medications can ingest much larger amounts of the element, possibly as high as 840-5000 mg/day (12-71 mg/kg-day) from antacids, 36-728 mg/day (1.8-10.4 mg/kg-day) from buffered aspirins and 828 mg/day (11.8 mg/kg-day) from anti-ulcer npounds when taken at recommended dosages (Lione, 1985).

There is a large amount of information available on the absorption, transfer from tissue to tissue and elimination of Al from the body, including data that have been amassed from studies on either human volunteers or laboratory animals. In general, the chemical appears to be poorly absorbed from the gastrointestinal tract, though the portion of the load that is retained will vary depending on the concentration, the chemical species administered, the fasting or fed state of the host, gastrointestinal pH, animal model, etc. For example, Yokel and McNamara (1988) administered single oral doses of a number of Al compounds (both water soluble and insoluble) to New Zealand white rabbits and obtained absorbed proportions of the load ranging from 0.27% to 27%. Fractional uptake of Al in humans under normal conditions (i.e., with no intake of large quantities of Al from medicine) was estimated to be 0.1-0.3% assuming an intake of 20 mg Al/day (0.3 mg Al/kg-day) and urinary excretion of 20-50 : g Al/day (0.3-0.7 : g Al/kg-day) (Ganrot, 1986). However, little information is available on the actual mechanism by which the element and its compounds are transported across the brush border. (Wilhelm et al., 1990; Lione, 1985).

Aluminum can also be absorbed by inhalation as indicated by age-related deposition in the lungs of the general population and exposure-related increased blood and urine concentrations in workers exposed to Al (Bast-Pettersen et al., 1994; Sjogren et al., 1996; Hosovski et al., 1990; Wilhelm et al., 1990; U.S. EPA, 1987). Aluminum occurs primarily in particulate form in the ambient atmosphere and as various dusts and fumes during its production and use. Common forms of inhaled Al include aluminum oxide (alumina; Al_2O_3), pyro powders (powder and flake Al-treated to reduce surface oxidation), Al welding fume, and soluble salts (e.g., uminum chloride and sulfate) (ACGIH, 1998).

urotoxicity as a Primary Toxicological Effect of Aluminum

One of the greatest health concerns regarding Al is its neurological effects. The first evidence for Al-induced neurotoxicity in humans was seen in patients who, as a result of receiving long-term hemodialysis for chronic renal failure, developed a degenerative neurological syndrome (dialysis dementia) characterized by the gradual loss of motor, speech, and cognitive functions (Alfrey, 1993). This dementia, attributable to Al in the dialysate, is usually fatal within 6-9 months after the first clinical signs appear. In addition, many patients received high oral doses of Al to act as phosphate binders. Autopsies of these patients revealed increased concentrations of Al in the gray matter and cerebral spinal fluid (CSF) but no evidence of neurofibrillary degeneration (NFD) despite the elevated Al levels. Once the connection between Al and dialysis dementia was established, Al was removed from dialysis fluid and the incidence of dementia rapidly declined, thereby strengthening the argument that Al was a causal agent in dialysis dementia.

Amyotrophic Lateral Sclerosis (ALS) and Parkinson's Disease (PD) are other neurological diseases which have been associated with Al exposure. ALS is a progressive disease of the Central Nervous System (CNS) that is characterized by an accumulation of neurofibrillary tangles. In Guam, southern West New Guinea, and parts of Japan there is an unusually high prevalence of ALS and PD. This may be related to the natural abundance of Al coupled with the virtual lack of magnesium and calcium in the drinking water supplies and soil of these areas. In a study designed to evaluate effects of high Al and low calcium levels in the diet, much like the conditions associated with Guam and other similar areas, cynomolgus monkeys were placed on a low calcium

diet either with or without supplemental Al and manganese (Garruto et al., 1989). Chronic calcium deficiency alone produced neurodegenerative effects, although neurofibrillary changes were most frequently seen in the monkeys on a low calcium diet supplemented with Al and manganese.

Aluminum has also been implicated as having an association with Alzheimer's Disease (AD) (Ganrot, 1986). However, there is no evidence that Al plays a causative role in its development. AD is a chronic progressive disease clinically characterized by a gradual loss of cognitive functions. The pathological diagnosis of AD is based on the presence of large numbers of neuritic plaques and neurons with neurofibrillary changes. The CNS alterations in AD patients differ from those found in sensitive animals given high doses of Al. Even though increased amounts of Al are found in AD patients, there are no neurofibrillary changes like those found in rabbits treated with large amounts of Al.

A large amount of experimental information exists in reports of studies that have explored the possible relationship between occupational exposure to emissions in Al foundries, smelters, etc., with an increased incidence of diseases such as neurological diseases and/or cancer. For example, the etiological link between the increased incidence of tumors at various tissue sites and exposure to Al-based emissions has been thoroughly explored (Gibbs, 1985; Thériault et al., 1984, 1990; Armstrong et al., 1986; Spinelli et al., 1991; Pearson et al., 1993; Tremblay et al., 1995). However, it has been generally concluded that the inferential association between exposure to Al and marginally increased incidences of tumors of the bladder and/or lung are confounded because of the co-exposure of subjects in such settings to other harmful and potentially carcinogenic substances, such as polycyclic aromatic hydrocarbons (PAHs and coal tar pitch volatiles (CTPV) (Ronneberg and Langmark, 1992). However, in contrast to this vitiation of the findings of possible relationships between exposure to Al and tumor formation, any epidemiological links between exposure to Al and neurotoxicological symptoms have generally been accepted, irrespective of the presence of other compounds or harmful substances to which subjects may have been co-exposed. This is rationalized by the recognition of the body of ancillary evidence that exists for the possible neurotoxicological effects of Al (with dialysis dementia as an example), thereby justifying the assumption that, on balance, the neurological symptoms displayed by persons occupationally exposed to Al among other substances are likely to be causally linked to Al rather than to any of the other contaminants. In the paragraphs that follow, reports of studies that have explored that potential neurotoxicological effects of Al borne in dust or fumes is summarized. Where possible, those data that point to a quantitative relationship between exposure and response are emphasized.

INHALATION TOXICITY

uman Toxicity

Principal Study

Neurobehavioral effects were evaluated in a group of 87 Al foundry workers who were occupationally exposed to 4.6-11.5 mg/m^3 Al fumes and dust for a mean of 12.0 years [standard deviation (SD) 4.5 years, shortest exposure 6 years] compared to an unexposed control group (n = 60) who were matched for age, job seniority and social status to exposed subjects (Hosovski et al., 1990). It is reported that environmental Al concentrations were measured for each worker separately during the winter and summer, implying that personal sampling may have been used and that the contributing concentrations are time-weighted averages. In certain places, the number of particles ranged as high as 329-1020/cm^2 air, and dust particle sizes were #1, 1-5 and $5 microns in 65.6, 26.6, and 7.6% of the samples, respectively. Tests of psychomotor ability (simple and complex reaction time, oculomotor coordination), intellectual ability (Wechsler intelligence, performance intelligence and verbal intelligence quotients, and Wechsler subtests on information processing, memory, understanding, calculation, coding, picture completion, picture grouping, object assembling, assembling of cubes and common concepts), and cerebral damage (Bender visual motor test) were conducted. Performance of the exposed workers was found to be significantly ($p<0.02$) impaired on the complex reaction time, oculomotor coordination, memory, coding, picture completion, and object assembling tests. However, the investigators noted that the performance deficits had no clinical manifestations, and that additional studies were probably needed to confirm the possibility of cerebral damage. The study yielded a lowest available non-duration adjusted LOAEL of 4.6 mg Al/m^3 for psychomotor and cognitive impairment during repeated 8-hour occupational exposures (Hosovski et al., 1990), that could be corrected for discontinuous exposure (10 m^3/20 m^3 and 5 days/7 days) to yield a $LOAEL_{HEC}$ of 1.64 mg/m^3 Al.

Supporting Studies

Aluminum oxide powders were administered to Canadian miners (mainly underground gold and uranium miners) in known exposures as a means of prophylaxis against silicosis (Stokinger, 1981; Rifat et al., 1990). Data in which more than 42 million Al treatments (. 150,000 man-years) had been given over a period of 27 years ending in 1971 were reviewed by Stokinger (1981). The effectiveness of this treatment is uncertain but no lung damage or other ill effects (not specified) were observed. The powders (McIntyre powder) were prepared by grinding Al pellets so that 96% of the particles were #1.2 : m in diameter. During this process most of the particles became oxidized to aluminum oxide; the powder contained 85% aluminum oxide and 15% elemental Al. According to Stokinger (1981), recommended exposure concentrations were 30,000 particles of respirable size per cubic centimeter (ppcc) for 10 minutes/day or 10,000-20,000 ppcc for 20 minutes/day (total treatment days not indicated). Rifat et al. (1990) stated that the recommended exposure was to an Al dust concentration of 20,000-34,000 parts per ml air in the miners' changing rooms before each shift for 10 minutes. Stokinger (1981) reported that the 30,000 ppcc concentration corresponds to . 350 mg/m^3, which is equivalent to an 8-hour average concentration of 2 mg/m^3. Based on the Stokinger (1981) data and the fact that one unspecified study used levels 30 times higher than advised, the TLV of 10 mg/m^3 is recommended for Al dust (ACGIH, 1998).

The increasing awareness of the potential neurotoxicity of Al has resulted in a number of investigations of the incidence of neurotoxicological symptoms in Al workers. Although treatment with McIntyre powder had not produced apparent adverse effects, a neurobehavioral evaluation of male miners (261 exposed to McIntyre powder, 346 unexposed) who started working between 1940 and 1979 (additional duration data not reported) was performed in 1988-1989 (Rifat et al., 1990). There were no significant differences between exposed and unexposed miners in reported diagnoses of neurological disorder. Results of cognitive testing (Mini-Mental State Examination for general cognitive function, Ravens colored progressive matrices test for reasoning, and Symbol Digit Modalities Test for spatial perceptual accuracy and information processing), however, showed that the exposed group had significantly (p#0.001) impaired performance on at least one test, and when all test scores were summed. Also, the likelihood of scores in the impaired range increased with duration of exposure.

A neurologic syndrome was described in Al smelting plant potroom workers (White et al., 1992). Twenty-five men were evaluated for suspected work-related neurologic illness based on findings in 3 patients studied previously. The average duration of employment was 18.7 years (SD, 3.6; range, 12-23 years), 15 of the patients were working at the time of evaluation, and 10 had taken early retirement or medical leave due to workplace-related symptoms (mean length of time since exposure was 1.3 years ranging from 0.2-5 years). Quantitative exposure level data were not reported, but 21 of the workers had been employed in the potroom prior to installation of fume hoods for a mean duration of 5.3 years (range 3-7 years). Symptoms most often reported by the patients were frequent loss of balance (88%), memory loss (84%), and joint pain (84%); other symptoms included dizziness (80%), numbness (80%), parasthesias (72%), and tremor (68%). Neurologic examinations showed mild to moderate signs of lack of coordination (tremor, dyssynergy of upper extremity limb movement, or ataxia) in 84% of the patients. Neuropsychologic effects were evaluated in 21 of the patients using the Wechsler Adult Intelligence Scale-Revised (intellectual functioning), Wide Range Achievement Test-Revised (academic functioning), Halstead-Reitan Neuropsychological Test Battery (neuropsychological assessment), and Minnesota Multiphasic Personality Inventory (personality functioning). Memory function was assessed with the Wechsler Memory Scale (14 patients) and Wechsler Memory Scale-Revised (8 patients). The memory function evaluation showed mild to moderate impairment on subtests of immediate recall for verbal or visual information (70-75% of the tested patients) and delayed verbal or visual recall (50-70%). Other effects included mild or moderate impairment on Halstead-Reitan tests of abstract reasoning and flexible thinking (42% of the tested patients), memory for tactile information (53%), and sustained attention and discrimination of tonal and speech patterns (44 and 64%, respectively). On the Wechsler memory and Halstead-Reitan tests, mild and moderate impairment was defined as scores 1.5-2 and $2 standard deviations below the mean of the normal population, respectively. Most (89%) of the patients tested with the Minnesota Multiphasic Personality Inventory had abnormally elevated scores ($2 SDs above the population mean) indicative of clinical depression. Significant positive correlations were found between severity of incoordination (signs and symptoms) and degree of exposure (qualitative) before the introduction of the ventilation hoods.

White et al. (1992) noted two other studies that described neurologic problems among Al smelter workers. Thus, an evaluation of 444 electrolysis workers found neuropsychiatric changes in 123 (28%), "neurotic syndromes" in 89 (20%), and "slight pyramidal and cerebellar changes" in 39 (9%) (Langauer-Lewowicka and Braszczynska, 1983). In the second study, symptoms including mental confusion, concentration, and memory problems were described in 6 potroom workers (Cawthon, 1988).

In another study of Al production workers, neuropsychological effects were assessed in 38 elderly men who had been exposed for at least 10 years exclusively in the potroom (n=14), foundry (n=8), or other manual bor departments of the same plant (n=16, control group) (Bast-Pettersen et al., 1994). The mean ages and ployment durations of the groups were in the ranges 62.5-63.5 years and 19.2-19.6 years, respectively. The ...en were examined soon after or just before retirement in 1991. Limited environmental monitoring data indicates that the degree of Al exposure varied between the subgroups and over the years. Average annual total dust concentrations in the potroom were reduced significantly from 9.5 mg/m^3 in 1977 to 3.0 mg/m^3 in 1990. Aluminum levels were not specifically reported, but the average Al content in the total potroom dust was approximately 20% by weight; other constituents of the dust included fluoride and coal tar pitch components. Data from an Al uptake/excretion study of workers from the same plant indicated that the level of Al exposure was approximately eight times higher in the potroom than in the foundry (0.48 and 0.06 mg/m^3, respectively) (Drablos et al., 1992). Medical examinations (including lung function, standard laboratory tests, and serum and urine Al concentrations) and a neuropsychological test battery were performed. The battery assessed six mental functions (neuropsychiatric symptoms, motoric/sensoric, reaction time, psychomotor speed/efficiency, memory/learning, and intelligence) using a questionnaire and 15 different objective tests. Some subtle deficits were found in potroom workers that were not considered to be indicative of a significant neurological syndrome. The findings in potroom workers included a subclinical tremor as indicated by results of a static steadiness test [time scores on one of two test indices were significantly worse in comparison with the control group (84% slower, p=0.03)], and possible tendencies (i.e., test results that were about 1 SD below normal mean values but not statistically significant) for increased risk of impaired visuospatial organization (Block Design subtest of the Wechsler Adult Intelligence Scale) and psychomotor tempo (one Halstead ReitanTrail Making test). Although these findings were not considered to be indicative of a neurologic syndrome, it was suggested that they may be early signs of CNS impairment. Additionally, the finding of a subclinical tremor seems to be consistent with the tremor and other signs of incoordination observed in 84% of the patients in the White et al. (1992) study summarized above.

Studies of Al welders are consistent with those of Al smelter workers in indicating that occupational exposure to Al can be neurotoxic. CNS function was evaluated in 17 welders who had an average of 15 years (range 5-27 years) experience, with the last 4 years exclusively with Al (Hanninen et al., 1994). Most of the welders had equipment that ventilated the welding masks but the respiratory protection was not always used. The assessment included measurements of serum and urinary Al, neuropsychological tests (simple reaction time, three tests for psychomotor speed, two tests for visual and spatial ability, four memory tests, and two verbal ability tests), a symptom questionnaire and neurological interview, quantitative electroencephalography (QEEG), and P-300 event-related auditory-evoked responses. Serum and urine Al levels were 3.5 and 8.5 times higher, respectively, than an unexposed reference population. The welders performed normally on the neuropsychological tests, although correlation analysis of test scores and exposure parameters showed weak negative associations between the four memory tests and urinary Al level, and a positive association between the variability (standard deviation) of visual reaction times and serum Al levels. Analysis of the QEEG data showed that serum Al levels were positively correlated with the amount of delta and theta activity in the brain frontal region and negatively correlated with the amount of alpha activity in the frontal region. Results of this study (disturbances of memory and attention, QEEG changes similar to those in patients with Al encephalopathy) were interpreted as consistent with known CNS effects of Al, but insufficient for establishing a definite relationship between Al exposure and effects.

In another study of Al welders, CNS evaluations were performed on 38 men who had at least 5 years exposure (mean 17.1 years), and a control group of 44 railway track welders exposed to metal fumes other than

Al (mean 13.8 years) (Sjogren et al., 1996). Limited monitoring data indicated that the median exposure to welding fumes was 10 mg/m^3 and that the Al content was 40% of the total fumes. Symptom questionnaires, psychological tests (simple reaction time, finger tapping speed and endurance, digit span, vocabulary, tracking, symbol digit coding, cylinders, olfactory threshold, and Luria-Nebraska motor scale), neurophysiological indices [electroencephalography, P-300 auditory-evoked responses, brain-stem auditory evoked responses and diadochokinesis (ability to perform rapidly alternating movements with one limb)], and blood and urine Al levels were assessed. The blood and urine Al concentrations were approximately 3 and 7 times higher in the Al welders than in the controls, but there were no clear correlations between duration of exposure to Al and concentration of Al in blood or urine. The Al welders reported more acute CNS symptoms (e.g., concentration difficulties) and had decreased motor function in five tests (finger tapping in non-dominant hand, two tasks from the Luria-Nebraska motor scale, pegboard peg movement with dominant hand, amplitude of diadochokinesis in dominant hand) when compared to the control group. Urinary Al concentration was significantly correlated with acute CNS symptoms, but not with any of the performance measures. To further study possible dose-effect relationships of Al exposure, the Al welders were combined with the control group and divided into three exposure categories according to urinary Al levels, using the 50th and 75th percentiles as category dividers. The group with the highest mean urinary Al level had significantly more acute CNS symptoms and significantly reduced performance on one of the motor function tests (a Luria-Nebraska motor scale task) when compared to the group with the lowest Al level. In an earlier study of 65 welders with $10 years exposure to Al fumes, the highest exposure category (based on exposure duration) was 2.8 times more likely than unexposed workers to have three or more neuropsychiatric symptoms (Sjogren et al., 1990).

Aluminum Toxicity in Experimental Animals

Groups of 20 weanling Fischer 344 rats/sex and 20 weanling Hartley guinea pigs/sex were exposed to 0, 0.25, 2.5 or 25 mg/m^3 aluminum chlorhydrate [$Al_2(OH)_5Cl@x(H_2O)$] for 6 hours/day, 5 days/week for 6 months (Steinhagen et al., 1978). Analysis of the aluminum chlorhydrate by the investigators showed it to contain 24.5% Al, indicating that the animals were exposed to 0, 0.061, 0.61, and 6.1 mg Al/m^3. Body weights were measured weekly for the first 8 weeks and biweekly thereafter. At the end of the exposure period, 10 animals (5/sex) of each species were sacrificed for organ weight measurements (heart, lung, liver, kidney, spleen, and brain) and histological examination of the lungs, liver, and kidney. In addition, comprehensive histological examinations were performed on animals in the control and 6.1 mg AL/m^3 groups. The remainder of the animals were used for hematology evaluation (RBC, WBC, hematocrit and hemoglobin) and Al measurements in blood and tissues. Apparent effects of Al included multifocal granulomatous pneumonia in both species at $0.61 mg Al/$m^3$, significantly increased absolute and relative lung weights in both species, and decreased body weight gain in rats and minimal lung edema in guinea pigs at 6.1 mg Al/m^3. The granulomatous reaction was characterized by foci of giant vacuoled particle-containing macrophages in the lungs and macrophages that did not appear to contain vacuoles or other evidence of phagocytized material in the peribronchial lymph nodes. There was a significant dose-related accumulation of Al in the lungs of both species at $0.061 mg Al/$m^3$. However, a NOAEL of 0.061 mg/m^3 could be identified for the onset of compound-induced histopathological effects.

In other studies, groups of 14-30 guinea pigs, rats, and hamsters were exposed to fine metallic Al powders (pyro, atomized, and flaked) at concentrations of 15, 30, 50, or 100 mg powder/m^3 air for 6 hours/day, 5 days/week for 6 months (Gross et al., 1973). Alveolar proteinosis occurred in exposed animals of all three

species after 2 months of exposure, but fibrosis or other pulmonary changes did not develop. Similarly, groups of 23 or 46 rats and 48 hamsters were exposed to undetermined concentrations of Al fumes or Al powder (20% Al, 80% $Al(OH)_3$) for morning hours only or morning and afternoon for up to 20 months (Christie et al., 1963). Effects were similar for both forms of Al in both species, including initial increased alveolar macrophage proliferation followed by nodular hyalinized areas, with development of pneumonia but no fibrosis.

Exposure to 2.18 mg Al fibers/m^3 for 6 hours/day, 5 days/week for up to 86 weeks produced slightly increased alveolar macrophages and some irritation of the nasal passages in a group of 50 Alderly Park rats (Pigott et al., 1981). Finally, a study by Drew et al. (1974) observed the development of granulomatous nodules also developed in male hamsters that were exposed to 8 mg Al/m^3 of *Alchlor* (a propylene glycol complex of aluminum-chloride-hydroxide) for 6 hours/day, 5 days/week for 20 or 30 exposures. The alterations persisted at the longest post treatment observation (6 weeks) and consistently developed at the bifurcation of the bronchioloalveolar ducts which is a likely site of particulate deposition.

DERIVATION OF A PROVISIONAL CHRONIC INHALATION RfC

As discussed earlier, unlike carcinogenicity or respiratory effects, that cannot be ascribed to Al inhalation due to the presence of other chemicals and confounding factors, Al seems to be the most likely cause for the generally and consistently reported psychomotor and cognitive effects (particularly signs of impaired coordination) in Al production workers and welders (Bast-Pettersen et al., 1994; Rifat et al., 1990; Hosovski et al., 1990; White et al., 1992; Hanninen et al., 1994; Sjogren et al., 1990, 1996). In addition, there is strong evidence that Al is neurotoxic by other routes of exposure. Thus, a degenerative neurological syndrome (dialysis dementia) has been documented in humans with chronic renal failure, apparently due to an increased exposure to Al from dialysis treatment and/or ingestion of phosphate binding agents which contain Al (Alfrey, 1993). This syndrome is characterized by gradual loss of motor, speech, and cognitive functions. Neurotoxicity, particularly neuromuscular effects such as decreased motor activity, startle responsiveness, and grip strength, has also been observed in mice following subchronic oral exposure and in the offspring of mice and rats exposed orally during gestation and/or lactation. Based on this information, as well as evidence that Al is absorbed by Al production workers and welders, the hypothesis that the occupational studies are indicative of a neurotoxic effect of Al appears to be justified. However, the only occupational study that has yielded suitable monitoring data is that of Hosovski et al. (1990), in which workers were exposed to presumed TWA concentrations of 4.6-11.5 mg Al/m^3 magnitude for an average of 12 years. Using 4.6 mg Al/m^3 as the LOAEL for psychomotor and cognitive impairment for an 8-hour occupational exposure (Hosovski et al., 1990) and corrections for discontinuous exposure (10 m^3/20 m^3 and 5 days/7 days), the $LOAEL_{HEC}$ is 1.64 mg/m^3. Applying an uncertainty factor of 300 for intrahuman variability (10), use of a LOAEL (10) and an incomplete database (3) yields a provisional RfC of

$$\mathbf{RfC = 1.64\ mg/m^3/300 = 5E\text{-}3\ mg/m^3.}$$

The lack of inhalation developmental studies may increase uncertainty in the database because oral data in animals indicate that neurotoxic and morphological developmental effects may occur at lower doses than neurotoxicity in adults. Additionally, there is uncertainty related to the lack of corroborating data on air concentrations associated with neurotoxicity. Confidence in the critical study is low to medium because only a LOAEL was identified. Confidence in the database is medium because (1) there are no corroborating data on effect levels (NOAELs and additional LOAELs), (2) no data are available for developmental neurotoxicity by the inhalation route, and (3) a well-designed two-generation reproduction study is lacking. Reflecting the low

to medium confidence in the critical study and database, there is low to medium confidence in the provisional RfC.

RISK CHARACTERIZATION

Cancer Hazard Summary There are no records for Al in the U.S. EPA's IRIS or HEAST databases (U.S. EPA, 1999, 1997), nor has the carcinogenicity of Al compounds been formally evaluated by the agency. However, a number of scientific investigations have addressed the issue of the carcinogenicity of Al, though with inconclusive results. For example, a 20-month exposure of B6C3F1 mice to aluminum potassium sulfate dodecahydrate in the diet at concentrations up to 10% w/w displayed no indication of compound-related carcinogenicity and, in general, no indication of adverse toxicological effects of any kind (Oneda et al., 1994). Similarly, the life-time exposure of Swiss mice and Long-Evans rats to 5 ppm Al as aluminum potassium sulfate in drinking water provided no convincing evidence for the carcinogenicity of Al compounds (Schroeder and Mitchener 1975a,b). A considerable number of epidemiological studies have examined the incidence of excess tumor formation in persons occupationally exposed to Al in the form of dusts or fumes. In general, a body of inferential evidence exists for an increase in cancer of the bladder and lung with occupational exposure to Al, though conclusions linking cause with effect are frequently confounded by co-exposure to other harmful emissions, cigarette smoking, and the absence of adequate reference populations. Taking all of the evidence of Al carcinogenicity together, a qualitative weight-of evidence classification of D, -not classifiable as to human carcinogenicity, is suggested, in line with the agency's guidelines for carcinogenic risk assessment (U.S. EPA, 1986). In accordance with the agency's proposed guidelines for carcinogenic risk assessment (U.S. EPA, 1996), the compound's carcinogenicity *cannot be determined* on the available evidence.

SUPPORTING INFORMATION

Human Data Occupational exposure to fumes and dusts containing Al compounds, for example, in welding shops, has provided insubstantial evidence of links to increased tumor incidence, in some studies. Overall, the links between cause and effect are considered marginal, at best, and are potentially by co-exposure to other carcinogenic substances.

Animal Data Studies of the carcinogenicity of Al compounds in experimental animals have yielded negative results.

Mutagenicity The small amount of evidence that exists on the capacity of the element to induce gene reversion in *S. typhimurium* is negative for Al compounds (Ahn and Jeffrey, 1995).

MODE OF ACTION

No data.

DISCUSSION

Epidemiological studies of metal dusts and fumes in such settings as welding shops, smelters, etc., have provided a body of evidence that suggests but does not prove that emissions containing a number of air-borne l may be carcinogenic. However, the evidence for such a proposition is weak, yielding data on the border- : of statistical significance, if at all. There is no hard evidence for the carcinogenicity of Al compounds via ue oral route.

BRIEFING SUMMARY

Routes	Class	Designation or Rationale	Dose Response
oral/inhalation	cannot be determined	not applicable	no data

Basis for classification/dose response

1. **Human data:** Insufficient evidence in epidemiological/occupational exposure studies.

2. **Animal data:** Existing evidence is largely negative for Al's carcinogenicity.

3. **Structural analogue data:** None.

4. **Other key data:** Available mutagenicity data are negative for Al compounds.

5. **Mode of action:** No data.

6. **Hazard classification/uncertainties:** The chosen weight-of-evidence descriptors are based on a lack of sufficiently hard evidence for the carcinogenicity of Al compounds. Positive evidence of non-carcinogenicity is also lacking.

7. **Dose response:** Not applicable

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Risk Assessment Issue Paper for:
Derivation of a Provisional Oral RfD for Aluminum (CASRN 7429-90-5)

NOTE: This provisional risk assessment paper for the oral chronic reference dose (RfD) for Aluminum has received external peer review.

INTRODUCTION

Verified toxicity values for aluminum (Al) and its compounds are unavailable on IRIS or HEAST (U.S. EPA, 1999, 1997), except for a chronic oral RfD of 4E-4 mg/kg-day for aluminum phosphide. However, occupational guidelines and standards have been established for a number of chemical and physical forms of Al, including, from ACGIH, 8-hour TWA-TLVs of 10 mg/m^3 for the compound as a metal dust or oxide, 5 mg/m^3 as "pyro" powders or welding fumes, and 2 mg/m^3 for soluble salts or organic forms of the metal (ACGIH, 1998). From NIOSH, 10-hour TWA-RELs of 10 mg/m^3 are specified for "total" Al dust versus 5 mg/m^3 for the respirable portion (NIOSH, 1994), NIOSH covers all other forms of the metal by identical values to those specified by ACGIH (ACGIH, 1998). OSHA PELs for Al include an 8-hour TWA value of 15 mg/m^3 for "total" metal dust, versus 5 mg/m^3 for the respirable portion (NIOSH, 1994). The U.S. EPA's CARA list (U.S. EPA, 1994) cites a HEA for Al (U.S. EPA, 1987), and ATSDR has updated its toxicological profile of the element (ATSDR, 1998).

Research papers pertinent to the potential toxicological effects of Al were sought through computer arches of the HSDB, RTECS, MEDLINE, and TOXLINE (and its subfiles) databases, covering the time od 1995-1999. The literature searches were conducted in June, 1999.

REVIEW OF THE PERTINENT LITERATURE

The review by Stokinger (1981) gives an account of Al as an all-pervasive component of products that are central to the daily lives of most Americans. For example, the metal is a crucial part of manufactured products for the building, automobile, and container industries, while Al as powder or flake is a component in a number of consumer products, such as paints, fireworks, etc. Al complexes and minerals are used in the brewing and paper industries, and as coagulants for water purification. Aluminum oxide finds application in abrasives, as a catalyst or absorbent, and as a component in fillers. Aluminum chloride is included in cosmetic formulations such as deodorants.

Human exposure to Al arises principally from food and water, through its widespread use in food additives, packaging and cooking utensils, and in Al-containing medications, particularly antacid, buffered aspirin, anti-ulcer and anti-diarrheal formulations (Marquis, 1989; Lione, 1985). Pennington and Schoen (1995) estimated daily Al intakes of 0.1-0.3 mg/kg-day for infants and children 6 months-6 years of age and 0.1-0.18 mg/kg-day for older children and adults, based on the FDA Total Diet Study (1993) and the U.S. Department of Agriculture Nationwide Food Consumption Survey (1987-1988). These data are in broad agreement with those of Wilhelm et al. (1995) who reported the dietary intake of Al in German children (living in the Duisberg area) as ranging from 0.008 to 0.11 mg Al/kg-day. In addition, these values are consistent with a range of 1-20 mg/day (0.014-0.3 mg/kg -day) for normal oral daily Al intake from food and water reported by other

investigators (Ganrot, 1986; Iyengar et al., 1987; Wilhelm et al., 1990). However, users of Al-containing medications can ingest much larger amounts of the element, possibly as high as 840-5000 mg/day (12-71 mg/kg-day) from antacids, 126-728 mg/day (1.8-10.4 mg/kg-day) from buffered aspirins and 828 mg/day (11.8 mg/kg-day) from anti-ulcer compounds when taken at recommended dosages (Lione, 1985).

Toxicokinetic of Aluminum

There is a large amount of information available on the absorption, transfer from tissue to tissue and elimination of Al from the body, including data that have been amassed from studies on either human volunteers or laboratory animals. In general, the chemical appears to be poorly absorbed from the gastrointestinal tract, though the portion of the load that is retained will vary depending on the concentration, the chemical species administered, the fasting or fed state of the host, gastrointestinal pH, animal model, etc. For example, Yokel and McNamara (1988) administered single oral doses of a number of Al compounds (both water soluble and insoluble) to New Zealand white rabbits and obtained absorbed proportions of the load ranging from 0.27% to 27%. Fractional uptake of Al in humans under normal conditions (i.e., with no intake of large quantities of Al from medicine) was estimated to be 0.1-0.3% assuming an intake of 20 mg Al/day (0.3 mg Al/kg-day) and urinary excretion of 20-50 : g Al/day (0.3-0.7 : g Al/kg-day) (Ganrot, 1986). However, little information is available on the actual mechanism by which the element and its compounds are transported across the brush border. (Wilhelm et al., 1990; Lione, 1985).

Although the overall extent of Al absorption is poor, there may be significant intake of the compound by those taking large amounts of Al compounds in patented remedies. As stated, absorption of Al is influenced by gastrointestinal conditions and content because Al can form various complexes with different solubilities and oxidation states depending on pH and interactions with dietary constituents. At low pH (3-5) in aqueous solutions, the soluble (ionic) forms of the Al prevail (Al^{3+}); at high pH (>8), Al in the form of soluble aluminum oxide is present; and at pH 5-8, the element is predominantly in the form of aluminum hydroxide, which is insoluble (van der Voet and de Wolff, 1986; Wilhelm et al., 1990). Ingested constituents that can influence absorption by forming complexes with Al include phosphate, fluoride, calcium, citrate and lactate. For example, Al is used to bind dietary phosphorus and decrease its absorption as a control for hyperphosphatemia, and citrate and lactate are complexing agents that can significantly increase Al absorption (Slanina et al., 1984, 1985, 1986; Partridge et al., 1989; Domingo et al. 1991; Ittel et al., 1991; Lione, 1985; Wihelm et al., 1990).

A number of recent reports of studies on the gastrointestinal absorption of Al have examined the influence of organic anions such as citrate. In general, the presence of such components appears to enhance the absorption of Al, within narrow limits. For example, Deng et al. (1998) administered a single oral dose of either distilled water, 2 mmoles/L aluminum chloride or 2 mmoles/L aluminum chloride plus 2 mmoles/L sodium citrate to 6 male Wistar rats/group. Animals were bled at 1, 2 and 4 hours after dosing, then terminated after 6 hours. Inductively coupled plasma (ICP) was used to measure Al concentrations in blood, bone (tibia), kidney, liver and the intestinal wall. Irrespective of treatment, the appearance of Al in the blood of dosed groups peaked after 1 hour, with the concentration of the element at higher levels in those animals receiving citrate in addition to aluminum chloride. In those animals receiving aluminum chloride alone, significant tissue concentrations of the element were restricted to the gastrointestinal wall. Those receiving citrate displayed measurable quantities of the element in several of the other monitored tissues, including bone.

Sutherland and Greger (1998a) used a similar dosing regimen to examine the kinetics of absorption and elimination of Al in male Sprague-Dawley rats that had received a single oral dose of 0, 0.25, 0.5 or 1

mmoles/L/kg body weight aluminum lactate in 1 mL of 16% citrate. Concentrations of Al in serum, liver, kidney or bone (tibia) were measured at various post-dosing time intervals up to 6 hours. Depending on the dose, absorption factors for Al of up to 4.2% of the administered dose were observed, with the greater proportion retained in bone. The authors reported a slower rate of absorption in those animals receiving Al at the higher doses, an observation potentially indicating reduced gut motility and/or saturation of the transcellular absorption processes at the higher concentrations. Aluminum deposited in kidney and bone appeared to turn-over at a slower rate than in the liver.

The influence of citrate on the gastrointestinal absorption of Al in man was examined directly by Taylor et al. (1998) who administered a drink containing Al and citrate to three volunteers. Aluminum and citrate concentrations were monitored in serial blood and urine samples for up to 24 hours. The kinetics of citrate and Al differed markedly, the former peaking in plasma after 32 minutes, versus 87 minutes for Al. This suggests that Al probably does not cross the gastrointestinal barrier as the citrate. Furthermore, the authors reported that the overall extent of Al absorption had probably not exceeded 1% in their experiment, a finding that contrasts with the higher values reported by Sutherland and Greger (1998a) in Sprague-Dawley rats and by Deng et al. (1998) in Wistar rats.

As discussed in a report by Glynn et al. (1999), gastrointestinal absorption of Al from aqueous media will be almost impossible to predict, because of the likelihood that the element will become absorbed to food particles in the intestinal lumen. Accordingly, depending on the dose, mode of delivery, and caloric state of the experimental animal (fed/fasted), significant amounts of aqueous forms of Al will be absorbed only when available binding sites on food have become saturated. This presents an inherently complex overall picture of the element's absorption since, additionally, the normal dietary content of Al will be substantial. Thus, it may be assumed that some sequestered Al will be absorbed along with non-sequestered water soluble forms of the element, while the rest will be retained within the gastrointestinal tract.

Sutherland and Greger (1998b) used their aluminum lactate in 16% citrate dosing regimen to examine the comparative importance of biliary versus urinary excretion of Al. Five to seven male Sprague-Dawley rats/group who had previously received an implanted bile cannula were treated by gavage. Another similarly-treated cohort of five animals/group were housed in metabolic cages immediately after dosing to provide 0-3 hour and 3-6 hour urine specimens. At termination, all animals were sacrificed and exsanguinated, and tissue, bile and urine samples were measured by graphite furnace atomic absorption spectroscopy. Among the key findings to emerge from this study was the incremental appearance of Al in bile as early as 15 minutes after dosing. However, overall amounts of Al were greater in the 3-hour urine samples than those that had accumulated in bile samples collected within a similar time frame. The fact that control rats excreted three times more Al in bile than in urine during the first 3 hours after dosing led the authors to conclude that, at low exposure to Al (in controls receiving Al solely from food), the liver is capable of excreting the element to the bile, a mechanism that becomes saturated as the level of Al administration becomes increased. Thereafter, urinary excretion becomes the primary route of elimination in circumstances of Al overload.

Prevailing perceptions of the overall toxicity of Al have changed during recent years. Thus, while the element has not been shown to have a definite biological function and was long regarded as nontoxic largely because gastrointestinal absorption is normally minimal, recent health effects research in humans and animals has shown that elevated levels of Al in the body may be toxic, particularly to the central nervous, skeletal and hematological systems.

Neurotoxicity as a Primary Toxicological Effect of Aluminum

One of the greatest health concerns regarding Al is its neurological effects. The first evidence for Al-induced neurotoxicity in humans was seen in patients who, as a result of receiving long-term hemodialysis for chronic renal failure, developed a degenerative neurological syndrome (dialysis dementia) characterized by the gradual loss of motor, speech, and cognitive functions (Alfrey, 1993). This dementia, attributable to Al in the dialysate, is usually fatal within 6-9 months after the first clinical signs appear. In addition, many patients received high oral doses of Al to act as phosphate binders. Autopsies of these patients revealed increased concentrations of Al in the gray matter and cerebral spinal fluid (CSF) but no evidence of neurofibrillary degeneration (NFD) despite the elevated Al levels. Once the connection between Al and dialysis dementia was established, Al was removed from dialysis fluid and the incidence of dementia rapidly declined, thereby strengthening the argument that Al was a causal agent in dialysis dementia.

Amyotrophic Lateral Sclerosis (ALS) and Parkinson's Disease (PD) are other neurological diseases which have been associated with Al exposure. ALS is a progressive disease of the Central Nervous System (CNS) that is characterized by an accumulation of neurofibrillary tangles. In Guam, southern West New Guinea, and parts of Japan there is an unusually high prevalence of ALS and PD. This may be related to the natural abundance of Al coupled with the virtual lack of magnesium and calcium in the drinking water supplies and soil of these areas. In a study designed to evaluate effects of high Al and low calcium levels in the diet, much like the conditions associated with Guam and other similar areas, cynomolgus monkeys were placed on a low calcium diet either with or without supplemental Al and manganese (Garruto et al., 1989). Chronic calcium deficiency alone produced neurodegenerative effects, although neurofibrillary changes were most frequently seen in the monkeys on a low calcium diet supplemented with Al and manganese.

Perhaps the best evidence for the neurotoxicological effects of Al in human beings comes from studies of patients with reduced renal function who accumulated Al as a result of long-term intravenous hemodialysis therapy with Al-containing dialysis fluid and, in many cases, concurrent administration of high oral doses of aluminum hydroxide or other Al salts to regulate phosphate levels. Inferential evidence that these health effects (dialysis encephalopathy) were associated with exposure to Al is suggested by the fact that such neurological impairments have largely disappeared with improved purification of dialysis water (Ganrot, 1986).

Though a cause and effect relationship between Al and three forms of chronic encephalopathy in humans: senile dementia of the Alzheimer type (SDAT, Alzheimer's Disease), endemic Amyotrophic Lateral Sclerosis (ALS) and endemic Parkinsonism-dementia (PD, a mixture of Parkinsonism and senile dementia) has been suggested, there is no firm evidence that it plays a causal role in the development of these diseases (Ganrot, 1986; Lione, 1985). Thus, in humans, dialysis encephalopathy syndrome is the only neurologic condition commonly accepted as being caused by Al (Ganrot, 1986). The condition is degenerative and characterized by the progressive loss of speech, motor and cognitive functions, with death typically occurring within 1-6 months. Autopsies of patients revealed increased concentrations of Al in the gray matter and cerebral spinal fluid (CSF), though with no conclusive evidence of neurofibrillary degeneration (NFD) or other neuropathological changes despite the elevated Al levels.

The neurotoxicity of Al is well documented in certain animal species. Aluminum induces a spectrum of behavioral abnormalities and brain neurofibrillary degenerative changes in rabbits and cats when injected intracranially or parenterally in high doses, though hamsters and monkeys are less sensitive (Ganrot, 1986; Lione, 1985). Such studies have been designed as models for the possible neurotoxicological effects of Al in humans. However, it should be noted that the neurofibrillary changes in affected animals differ in

morphological detail from those associated with SDAT. As discussed further in the Oral Toxicity section, oral doses of Al can also induce neurobehavioral effects in adult mice and rats and in their developing offspring. In general, such neurotoxic effects of Al appear to be more subtle than those induced through routes of administration that by-pass the gastrointestinal tract, perhaps reflecting the lower doses of Al reaching the brain.

Recent reports of studies on the effects of Al on neurotoxicity in animals have sought to define the biochemical mechanisms that are impaired when Al crosses the blood-brain barrier. However, a unifying concept has yet to emerge, though the passage of the element into various regions of the brain has been clearly demonstrated (Deloncle et al., 1995). Among the many biochemical functions and processes that appear to be perturbed by the presence of Al in the brain are the peroxidation status of biological membranes (Katyal et al., 1997; Deloncle et al., 1999), inhibition of the neuronal glutamate-nitric oxide-cyclic GMP pathway (Cucarella et al., 1998), and the marked reduction of protein- and non-protein-bound thiols and the specific activity of Na^+/K^+ and Mg^{++} ATPases (Katyal et al., 1997). The relative importance of each of these mechanisms and how (or whether) they interact to bring about the observed physiological changes remains unclear.

Osteomalacia was frequently observed among long-term dialysis patients with neurological signs and is commonly attributed to Al overload (Ganrot, 1986; Lione, 1985). This bone condition is characterized by widened osteoid (unmineralized bone matrix) with no fibrosis, reduced mineralization rate, skeletal pain and a strong tendency for fractures, lack of response to vitamin D therapy, and increased Al concentration in bone. Effects on bone histology and elevated bone Al levels have also been observed in patients with normal renal function who received total parenteral nutrition with Al-contaminated casein as a protein source, and in parenteral Al loading induced osteomalacia in rats and dogs (Lione, 1985).

ORAL TOXICITY

In contrast to the well-characterized symptoms associated with dialysis encephalopathy, very few reports have been identified that address the toxicological effects of Al in humans exposed orally. Furthermore, in a review, Reiber et al. (1995) pointed to the conflicting findings that have been reported when the incidence of neurological symptoms has been assessed in relation to Al exposure in either cross-sectional, ecological or case-control epidemiological studies. Among the more recent studies that have used this approach, Martyn et al. (1997) discussed the findings of a case-control study involving 441 men in England and Wales who were afflicted with either Alzheimer's disease, brain cancer, dementia or other neurological conditions. Assessing the historical exposure of these subjects failed to establish a link between Al in drinking water at the prevailing concentrations (below 0.2 mg/L) and the incidence of one or more of the conditions under investigation.

Numerous subchronic animal studies were located in the biomedical/toxicological literature but only those that define the threshold region of the oral dose-response relationship are summarized in this issue paper. A major limitation of many of the studies of Al toxicity is the lack of complete information on total dietary (e.g., food and drinking water) intake of Al and of other elements that are known to effect Al biokinetics and toxicity (e.g., calcium and magnesium). For example, Golub et al. (1992a) reported that commercial grain-based mouse feeds contain high levels of Al (200-1200 ppm), as well as excess and variable amounts of essential and nonessential trace minerals and metal binding ligands. Estimated or reported dosages used in studies in which Al content of the basal diets are not reported must be assumed to underestimate the actual experimental dosages. The magnitude of the underestimate may be considerable. For example, a range of Al contents of 200-1200 mg Al/kg for commercial grain-based diets (Golub, 1992b) would provide 30-200 mg Al/kg bw-day in a subchronic or chronic mouse bioassay [based on U.S. EPA (1988) default values for body weight and food

intake]. On this basis, studies in which complete dietary Al intakes were not reported or could not be estimated may provide some information about the hazards of oral exposure to Al but are inappropriate for establishing NOAELs or LOAELs for the critical effect of Al. NOAELs and LOAELs from studies that provide estimates of total Al dosages, or otherwise provide information relevant to determining the NOAEL/LOAEL boundary for the critical effect of Al are presented in Table 1 and are summarized below.

Systemic Toxicity

Groups of 10 female Sprague-Dawley rats were administered aluminum nitrate nonahydrate in sugar-containing drinking water at doses of 360, 720 and 3600 mg/kg-day (26, 52 and 259 mg Al/kg bw-day, respectively) for 100 days (Domingo et al., 1987). A control group received sugar-containing distilled water only. Sugar had been added to the drinking water of all groups to reduce the taste-aversive effects of Al. The level of Al in the diet was not reported. Animals were housed in metabolic cages to facilitate the collection of fecal and urine samples. Food and water consumption were measured daily, body weights weekly, and blood samples were taken a monthly intervals and at termination to monitor clinical chemistry and hematological parameters. At termination, all animals were necropsied, and the weights of major organs (brain, heart, lungs, kidneys, liver, and spleen) were monitored. Aluminum concentrations were measured in various tissues, pieces of which were processed for histopathological examination. A significant decrease ($p<0.05$) in body weight gain was observed in the 259 mg Al/kg-day group, attributed by the authors to decreased food intake. Overall, no consistent variations in hematological (hemoglobin, hematocrit) or clinical chemistry (SGOT, SGPT, alkaline phosphatase, urea, creatinine, total protein, cholesterol, glucose) parameters were observed. No histopathological alterations in the heart, liver, kidney, spleen, brain and cerebellum were observed. Interpretation of these data was complicated by the concurrent exposure of the rats to high doses of nitrate of up to 475 times the RfD for nitrate (1.6 mg nitrate-nitrogen/kg-day) which is based on methemoglobinemia in humans (U.S. EPA, 1999). Therefore, because of nitrate co-exposure, the absence from the study design of a food-restricted control group and uncertainty surrounding the contribution of Al in food, the apparent effect of Al on body weight gain cannot be conclusively attributed to Al alone.

Some recent studies have identified a number of potential toxicological responses in laboratory animals exposed orally to Al compounds in a subchronic or chronic dosing regimen. In most cases, however, only one dose level was employed in the study compared to controls, and since the amount of Al in the diet was not given, the resulting dose level represents an incremental dose of Al compared to that of controls as baseline. However, while these studies may offer inadequate quantitative dosimetric information for NOAEL/LOAEL identification and consequent RfD development, they provide an qualitative indication of a range of potential toxicological responses that might be induced in humans exposed to the element. For example, Garbossa et al. (1998) studied the potential for water-soluble Al to affect the erythropoietic integrity of late erythroid progenitor cells in the bone marrow. Three groups of five male Wistar rats/group were either (1) gavaged with citrate at a dose of 1.0 : m Al/g-day (27 mg/kg-day), 5 days/week, for 15 weeks, (2) had drinking water containing 100 mmol Al/L made available to them as the citrate for the same length of time, or (3) maintained as controls. As calculated by the authors, the dose associated with the applied concentration of Al in drinking water approximated to 14-17 : mol/g-day (420 mg/kg-day). Rats had access to a standard chow diet, though with no indication of the baseline concentration of Al provided therein. At the end of the in-life phase of the study, all rats were sacrificed, and samples of blood were obtained for hematological investigation. Femoral bone marrow cells were flushed with physiological medium, stimulated with recombinant human erythropoietin, then monitored for the comparative incidence of colony-forming units-erythroid (CFU-E).

Further tests were carried out to monitor the osmotic fragility and average life-span of erythrocytes from each test group. The animals in the group receiving Al at the higher dose showed decreased hematocrit, hemoglobin ncentration, median osmotic fragility and erythrocyte life-span values compared to controls. The content of increased in the serum and bone of both exposed groups, the distribution of concentrations in bone correlating inversely with the extent of an animal's CFU-E development.

That Al in drinking water may have the ability to cause histopathological changes and altered hepatic enzyme activities was suggested by Basu et al. (1997) who made available aluminum chloride in drinking water to groups of eight male Sprague-Dawley rats at a dose of 50 mg/kg-day (10.1 mg Al/kg-day) for 40 days. Additionally, other groups of similarly-treated rats received drinking water containing either 0, 50, 100, 200 or 400 ppm (mg/L) added calcium (Ca), as the chloride. The authors reported increased specific activities of acid and alkaline phosphatases in liver 10,000 x g supernatants from Al-receiving animals versus controls, and in alkaline phosphatase activity in equivalent kidney preparations. The presence of Ca in the drinking water appeared to reverse these changes, plus the accompanying histopathological features associated with them.

Konishi et al. (1996) examined the ability of Al and Ca to cause opposite and potentially harmful effects in laboratory animals, in relation to the well-documented association between Al and the onset of osteomalacia. Male STD Wistar rats were divided into four groups (n = 4), receiving either (1) a normal diet (Group I), (2) a normal diet supplemented with Al (Group II), (3) a Ca-deficient diet (Group III), or (4) a Ca-deficient diet with supplemental Al (Group IV), for 10 weeks. Blood samples were taken at termination, then animals were perfused with paraformaldehyde/glutaraldehyde fixative. Levels of Ca, iron (Fe) and Al in serum and bone were measured by atomic absorption spectrophotometry, and sections of the resected right tibia were prepared for histopathological examination after decalcification in 5% formic acid in 10% formalin.

There were statistically-significant changes in body weight gain when those of groups 3 and 4 were pared to animals from groups 1 and 2, the values for the latter groups remaining constant from about 4 ..eks of dosing. In discussing their histopathological findings, the authors described no decrease in the thickness of cortical bone in Group II compared to control, while bone specimen from Groups III and IV showed "an increase in osteoid as well as osteoblasts and osteoclasts", in addition to other disturbances of ossification. Such effects were considered to suggest bone fragility, with changes being more marked in Group IV compared to III. The amount of Al in the tibia of exposed rats was significantly greater in Group II than in Group I, whereas the average levels in Groups III and IV showed a further increase in Al deposition, most notably in group IV. There were also differences among the groups in the concentration of Fe in bone (tibia), and in the concentrations of Al, Ca, Fe and the levels of parathyroid hormone in blood. The authors concluded that Ca deficiency appeared to potentiate the deposition of orally administered Al in bone, and the attendant inhibition of ossification. Iron deposition was also thought to play a role in the osteogenic disturbance, where Ca is deficient.

A histopathological investigation indicated profound changes in the cerebrovascular and neuronal integrity when male Long-Evans rats (n=9) were exposed for 52 weeks to 0.5 ppm aluminum fluoride in drinking water (Varner et al., 1998). This corresponded to an Al dose of 0.019 mg/kg-day, based on a default drinking water consumption of 0.057 L/day, and a default body weight of 0.472 kg for male Long-Evans rats (U.S. EPA, 1988). .Duel control groups received either NaF (fluoride controls) or double distilled deionized water. Tissue levels of Al were measured in brain, liver, and kidney by the use of a direct current plasma technique. Animals receiving aluminum fluoride showed poor survival compared to the other groups, with 6/9 having died by week 48. The tissue concentrations of Al were increased in the brain and kidney compared to

both the control groups, with Al-fluorescence being used to demonstrate that Al deposition was mostly in the vasculature. Morphological and histopathological changes due to treatment were apparent in the liver, kidney and spleen. Some changes in neuronal integrity were also evident in the hippocampus and neocortex. Other cytological changes in the brain were associated with chromatid clumping, pyknosis and vacuolation.

A report by Somova et al. (1997) describes a study in which 10 male Wistar rats/group received either 0, 5 or 20 mg/kg-day aluminum chloride by gavage in water for 6 months. At termination, all animals were exsanguinated, then subjected to a necropsy in which excised pieces of liver, kidney and cardiac and skeletal muscle were taken for histopathological examination. Pieces of brain were examined by electron as well as light microscopy, and all tissues were monitored for Al concentration by atomic absorption spectrophotometry. As tabulated by the authors, Al in plasma and all of the listed tissues was dose-dependently increased to levels that were statistically significantly greater than controls. However, though described in qualitative terms and illustrated photographically, the Al-induced lesions did not receive a quantitative treatment in the report. Thus, while at least some of the low dose rats displayed NFD (neuro fibrillar degeneration) of the hippocampal region of the brain, insufficient data are provided in the report to apply this observation to the identification of a NOAEL or LOAEL.

Dietary Experiments

Six Beagle dogs/sex/group were fed a diet providing either, in males, 0, 118, 317 or 1034 mg/kg-day sodium aluminum phosphate (0, 3.4, 9.0 or 29.4 mg Al/kg-day, respectively) or, in females, 0, 112, 361 or 1087 mg/kg-day sodium aluminum phosphate (0, 3.2, 10.3 or 30.9 mg Al/kg bw-day, respectively), for 6 months (Katz et al., 1984). No information was available on the level of Al in the diet, and no compound-related effects on body weight gain, hematological and clinical chemistry parameters (parameters not specified), or histopathological endpoints (major organs and tissues examined) were observed. A highest NOEL of 30.9 mg Al/kg-day could be tentatively identified in this study, but this would not include the contribution of Al from the basal diet, nor reflect the identification of any toxicological effects, since the NOEL occurred at the upper limit of the dose-response curve.

Neurotoxicity

A number of studies have been reported in which neurotoxicological/neurobehavioral effects have been explicitly evaluated. In others, the effects of Al on neurological developmental have been addressed. For example, Golub et al. (1989) fed diets containing Al as the lactate at 25 (controls), 500 or 1000 mg Al/kg diet (3.3, 65 or 130 mg Al/kg-day) to groups of 15 female Swiss-Webster mice for 6 weeks (Golub et al., 1989). No mice were exposed to lactate alone. While no statistically significant differences in food intake or body weight gain were observed, mice fed the highest Al concentration gained less weight than the controls or low-dose group. As reported by the authors, a significant decrease (20%) in spontaneous motor activity (i.e., total, vertical, and horizontal movement) was observed in the 130 mg Al/kg-day group. Activity in the 65 mg Al/kg-day group was not significantly different than the controls. Thus, the highest NOAEL is 65 mg Al/kg-day and the LOAEL is 130 mg Al/kg-day.

Neurobehavioral effects of aluminum lactate were evaluated in groups of 12 female N:NIH Swiss-Webster mice (4.5-5.5 weeks old) that were fed 25 (controls) or 1000 mg Al/g diet for 90 days (Golub et al., 1992a). Based on a food factor of 0.19 kg diet/kg body weight/day calculated using an algorithm relating food consumption to body weight (U.S. EPA, 1988) and reported body weight data (the time-weighted average weight is 25.4 g), the dosage in the treated mice is estimated to be 190 mg Al/kg bw-day. No mice were

exposed to lactate alone. A neurobehavioral test battery used by Donald et al. (1989) was administered at the beginning of the experiment (day 0) and after 45 and 90 (±3) days, with motor activity evaluated at the latter two time points. Aluminum levels were measured in brain, femur and liver at the end of the exposure period.

Body weight was significantly increased in the treated mice but no exposure-related changes in food intake or overt signs of neurotoxicity were observed. Results of the neurobehavioral tests showed significantly decreased hindlimb grip strength at 90 days, decreased air puff startle response at 90 days and decreased auditory startle response at 45 days in the treated mice. Spontaneous motor activity was reduced at 90 days as indicated by decreased total activity counts, horizontal activity counts and percentage of intervals with high activity counts. Aluminum concentrations in the brain and liver were increased approximately threefold in the treated mice, but brain and liver lipid peroxidation indices were not altered.

Male Wistar rats (6-8 per group) were exposed continuously for 6 months to food containing 1.52 mg Al/kg (normal diet) or 1000 mg Al/kg as aluminum chloride with citrate (Florence et al., 1994). The average daily Al intake was estimated to be 0.13 or 84 mg Al/kg bw-day, assuming a body weight of 0.305 kg (arithmetic mean of default mature weight of male Wistar rats and the starting weight in this study of 0.11 kg) and a food intake of 0.026 kg food/kg bw-day, calculated using an algorithm relating food intake to body weight (U.S. EPA, 1988). The citrate content of the diet was in a 1:1 stoichiometric proportion to Al, therefore, the estimated daily intake was 598 mg/kg-day. Rats exposed to Al developed histopathological abnormalities in brain tissue, not specific to any brain region, characterized by extensive cytoplasmic vacuolization in astrocytes, swelling of astrocytic processes, particularly of astrocyte end-feet abutting blood vessels. Neurons also exhibited vacuolization and nuclear inclusions. Although no specific behavioral assays were reported, the investigators noted that "no significant behavioral changes were observed". Accordingly, the functional significance of the histopathological lesions is uncertain. The lesions appear to differ from the NFD observed with parenteral Al exposures (Kowall et al., 1989; Wakayama et al., 1993); or from exposures to Al in combination with calcium deprivation (Garruto et al., 1989; Kihira et al., 1995; Mitani, 1992). The LOAEL for histopathological changes in the brain was 84 mg Al/kg-day.

Male Sprague-Dawley rats (40 per group) were exposed in drinking water to 0, 50 or 100 mg Al/kg bw-day as aluminum nitrate with citric acid for 6.5 months beginning at 21 days of age, 8 months of age, or 16 months of age (Domingo et al., 1996). The citric acid dosage was 355 or 710 mg/kg-day in the 50 or 100 mg Al/kg bw-day groups, respectively. Controls did not receive citric acid. Dietary Al intake was not reported; the rats were maintained on Panlab rat chow. Animals from control and exposed groups were subjected to a number of neurobehavioral tests, and at termination, Al levels were measured in various excised regions of the brain. The authors observed the highest Al levels in the olfactory bulb and rhachidical bulb, while the cortex and thalamus were the regions showing the lowest Al content. However, compared to controls, there were no significant effects ($p>0.05$) of Al (with citric acid) on spontaneous motor activity (open-field) or passive avoidance operant training or performance (grid floor shock, light/dark shuttle box). Thus, the NOAEL was 100 mg Al/kg-day with citric acid; although this does not include the Al contribution from food. This study is listed on Table 1 because the NOAEL, although probably underestimated because of unreported Al intake from food, is still lower than the LOAELs from other studies.

Groups of 6 male albino rats were administered 0 or 25 mg Al/kg bw-day as aluminum nitrate in normal saline by gavage, 10% ethanol in drinking water, or 25 mg Al/kg bw-day by gavage combined with 10% ethanol in drinking water, 6 days/week for 6 weeks (Flora et al., 1991). The level of Al in the diet was not

reported. Urinary ª-aminolevulinic acid (ALA), blood ALA-dehydratase (ALAD), blood zinc protoporphyrin (ZPP), glutamic oxaloacetic transaminase (GOT) and glutamic pyruvic transaminase (GPT) in serum and liver, and brain biogenic amines and their metabolites [dopamine (DA), norepinephrine (NE), 5-hydroxytryptamine (5-HT), homovanillic acid (HVA) and 5-hydroxyindolacetic acid (5-HIAA)] were evaluated at the end of the treatment period. Treatment with Al alone caused significantly increased blood ALAD ($p<0.01$), decreased liver GPT ($p<0.05$), decreased brain DA ($p<0.01$), increased brain NE ($p<0.05$) and decreased brain 5-HT ($p<0.05$). Compared to treatment with Al alone, concurrent exposure to ethanol and Al produced significantly decreased ALAD, increased ALA, increased ZPP, increased liver GPT, increased serum GOT and increased brain HVA. Significant changes found only in the combined Al and ethanol group included increased serum GPT, increased brain NE and decreased brain 5-HT. Treatment with ethanol alone only inhibited blood ALAD. The rats were co-exposed to relatively high levels of nitrate [comparable to those in the Domingo et al. (1987) subchronic study], but it seems likely that some of the changes (i.e., effects on brain chemicals) are related to aluminum which is known to be neurotoxic. Because the toxicological significance of the changes is unclear due to lack of evaluation of neurobehavioral performance and other endpoints, there is uncertainty whether the 25 mg Al/kg-day dose is a NOAEL or a LOAEL, an uncertainty compounded by the absence of information about the level of Al in the basal diet.

Reproductive/Developmental Toxicity

A number of studies have been carried out to examine the effects of Al compounds on developmental toxicity, particularly their effects on postnatal neurobehavioral development. For example, Bernuzzi et al. (1989) exposed groups of 6-12 pregnant Wistar rats to aluminum chloride or aluminum lactate in the diet on gestational days 1 through 21. The rats received nominal daily doses of 0, 100, 300, 400 mg Al/kg as aluminum chloride or 0, 100, 200, or 400 mg Al/kg as aluminum lactate. No rats were exposed to lactate alone, and information regarding level of Al in the basal diet was not reported. On the average, there was a less than 10% decrease in maternal body weight gain and no effect on food or water intake. No significant difference in litter size was observed. However, postnatal mortality increased 55% and 26% in offspring of the rats exposed to 300 or 400 mg Al/kg-day, respectively. The offspring of dams fed $ 300 mg Al/kg-day weighed significantly less than controls on postnatal day 1. Decreased body weight was also observed on postnatal days (PD) 4 and 14 in the offspring of rats fed 400 mg Al/kg-day as aluminum lactate. The following tests were used to assess neuromotor development (maturation): righting reflex, grasping reflex, negative geotaxis, suspension test, and locomotor coordination. The tests were performed on PDs 4, 6, 9, 12 and 20, respectively. Impairment of neuromotor development (righting and grasping reflexes) was observed in the pups exposed to $ 200 mg Al/kg-day. Impaired grasping reflex was also observed in the 100 mg/kg-day aluminum lactate group. Offspring of rats fed 400 mg/kg-day also exhibited altered performance on the locomotor coordination test.

A follow-up study by the same research group found that ingestion of 400 mg Al/kg bw-day as aluminum lactate had no effect on postnatal mortality, body weight and righting and grasping reflex tests (Muller et al., 1990), although significant differences between control and exposure groups were noted in locomotor coordination and operant conditioning tests. Significant differences between controls and exposed groups in the negative geotaxis test were limited to those pups of dams treated during the second and third weeks of gestation, a finding interpreted by the authors to indicate the possibility of long-term effects on the central nervous system of trans-placenta exposure to Al during a later organogenic phase. According to Muller et al. (1990), the contradictions between this and their earlier study (Bernuzzi et al., 1989) could be related to environmental modifications. In particular, the mothers and pups were much more protected in the Muller et al.

(1990) study than in the previous one because they were housed in plastic cages instead of wire mesh cages and received cotton to build nests. Body temperature of the pups, therefore, may have been more adequately maintained in the Muller et al. (1990) study. As discussed in this study, toxicity in pups can be confounded by insufficient body temperature, and delayed pup weight gain could explain the differences in neuromotor performance.

Muller et al. (1990) administered diets supplemented with 0 or 400 mg Al/kg bw-day as aluminum lactate to groups of 6-9 pregnant Wistar rats on days 1-7, 1-14, or 1-21 of gestation. No rats were exposed to lactate alone, and information regarding level of Al in the basal diet was not reported. Neuromotor development was assessed on postnatal days 4, 6, 9, 12 and 20 using tests of righting reflex, grasping reflex, negative geotaxis, suspension and locomotor coordination, respectively. Learning ability was also tested on PD 65 using operant conditioning. No effects on maternal body weight or food intake was observed in dams exposed on gestational days 1-7 or 1-14. In the dams exposed on gestational days (GD) 1-21, a significant decrease in maternal body weight (26 and 35%, respectively) was observed on days 16 and 19 of gestation. Decreased food intake was also observed on day 19 of gestation. No effects on litter size, postnatal mortality, or postnatal body weight were observed. Impairment of neuromotor development ($p<0.05$) was observed in 2 of the 5 tests (negative geotaxis and locomotor coordination); no differences between the three treated groups were observed. For the operant conditioning test, there were significant differences ($p<0.05$) between the treated and control young rats. No differences between the 3 treated groups were observed. The LOAEL for developmental toxicity is 400 mg Al/kg-day, but this does not include the contribution of Al from the basal diet.

Groups of 10 pregnant Sprague Dawley rats were administered 180, 360, or 720 mg/kg-day aluminum nitrate nonahydrate by gavage (13, 26, 52 mg Al/kg bw-day) on GDs 6-14 (Paternain et al., 1988). A vehicle (water) only control group was used. The level of Al in the diet was not reported. Aluminum exposed dams gained significantly less weight than the controls. No significant effect on the numbers of litters, corpora lutea, total implants, live fetuses, resorptions, or runt fetuses were observed. Significant decreases in fetal body weight and tail length were observed at all three Al doses; decreased fetal body length was also observed at the 52 mg Al/kg-day dose level. No dose-related external or visceral malformations were observed in the offspring. However, a significant increase in the incidence of skeletal malformations (delayed ossification, hypoplastic deformed ribs) was observed at all three treatment levels. In addition, the incidence of hematomas was significantly increased at the high dose. Because the rats were co-exposed to relatively high levels of nitrate [comparable to those in the Domingo et al. (1987) subchronic study], the effects of treatment cannot be conclusively attributed to Al alone, in the absence of a nitrate-exposed control group.

By contrast to the striking findings of potentially teratogenic effects of aluminum nitrate in Sprague-Dawley rats, as described above (Paternain et al. 1988), equivalent experiments by Domingo et al. (1989) in Swiss mice did not reveal any reproductive, developmental or teratogenic effects of Al, when administered to dams as the hydroxide. Domingo et al. (1989) administered by gavage 0, 66.5, 133, or 266 mg/kg-day aluminum hydroxide (0, 23.9, 47.8, 95.5 mg Al/kg bw-day) to groups of 20 pregnant Swiss mice on GD 6-15. The level of Al in the diet was not reported. The dams were killed on GD 18. No compound-related effects were observed on maternal mortality, clinical signs, body weight, food intake, or absolute or relative heart, lung, spleen, liver, kidney and brain weights. In addition, no compound-related effects were observed on numbers of implantations, resorptions, live and dead fetuses, sex ratio, and the incidences of external malformations, internal soft-tissue defects or skeletal abnormalities. Therefore, this study identifies a NOEL of 95.5 mg Al/kg-day by default for reproductive, developmental and teratogenic toxicity in mice. However, neuromotor development was not assessed and the contribution of Al from the basal diet was not stated in the report.

A number of studies have been designed to evaluate the influence of citrate or lactate on the potential developmental toxicity of Al. For example, Gomez et al. (1991) exposed groups of 15-19 pregnant Sprague-Dawley rats to either distilled water (controls) or 133 mg Al/kg bw-day in the form of either aluminum hydroxide (384 mg/kg-day), aluminum citrate (1064 mg/kg-day) or aluminum hydroxide (384 mg/kg-day) concurrent with citric acid (62 mg/kg-day) by gavage on GD 6-15. The level of Al in the diet was not reported and no rats were exposed to citric acid alone. Terminations were performed on GD 20. Maternal and fetal evaluations showed exposure-related effects only in the group exposed to aluminum hydroxide and citric acid concurrently. Significant changes included reduced maternal body weight gain on GDs 6-20 (but not at sacrifice on day 20), reduced fetal body weight and some skeletal variations (increased delayed occipital and sternebrae ossification and increased absence of xiphoides). No effects were seen on maternal food consumption or clinical signs, maternal absolute or relative liver, kidney or brain weights, gravid uterine weight, corpora lutea/dam, implantations/litter, pre- or postimplantation loss/litter, viable or nonviable implants/litter, fetal sex ratio or fetal malformations (external, visceral or skeletal). This study identified a stand alone minimum LOAEL of 133 mg Al/kg-day for non-neurobehavioral developmental toxicity of aluminum hydroxide and aluminum citrate in rats. Although confidence in this LOAEL is low (because aluminum hydroxide administered concurrently with citric acid induced did developmental effects and because the dose does not include a contribution of Al from the basal diet) the value is consistent with the developmental NOAEL of 95.5 mg Al/kg-day for aluminum hydroxide in mice (Domingo et al., 1989).

In a similar experimental protocol, groups of 11-13 pregnant female Swiss albino (CD-1) mice were administered 57.5 mg Al/kg bw-day as either aluminum hydroxide (166 mg/kg-day), aluminum lactate (627 mg/kg-day) or aluminum hydroxide (166 mg/kg-day) concurrent with lactic acid (570 mg/kg-day) by gavage on gestation days 6-15 (Colomina et al., 1992). Other groups were treated with lactic acid alone (570 mg/kg-day, equivalent to the amount in 627 mg/kg of aluminum lactate) or distilled water (controls). The level of Al in the diet was not reported. Fetal evaluations were performed on GD 18, including examinations for skeletal and visceral abnormalities in approximately two-thirds and one-third of the pups, respectively. The investigators noted that the dose of Al (57.5 mg/kg-day) is equivalent to ingestion of 3.5 g Al/day by a 60 kg person, which is higher than the usual quantities of Al ingested therapeutically for peptic disorders. Maternal body weight gain was significantly lower than control values in the aluminum lactate-treated mice when evaluated over GDs 6-9 (92%), 6-12 (55.6%) and 0-18 (38.5%), and in the mice treated with combined aluminum hydroxide and lactic acid evaluated over GDs 6-12 (37.8%), 6-15 (42.7%) and 0-18 (15.7%). The decreased maternal weight gain in the aluminum lactate group was accompanied by significantly reduced food consumption during gestation days 6-18. Significant developmental and/or teratological effects in the aluminum lactate group included 16% reduced fetal body weight ($p<0.01$) and increased incidences of cleft palate (13.2%, $p<0.05$), dorsal hyperkyphosis (i.e., excessive flexion of spine) (13.5%, $p<0.05$) and delayed parietal ossification (15.4%, $p<0.01$). These developmental effects were not observed in any of the control or aluminum hydroxide exposed pups, and the only other significant changes in the other groups were decreased maternal relative liver weight and delayed fetal parietal ossification in the lactic acid only exposure group. Other types of internal or skeletal malformations or variations were not found in any of the fetuses. Additionally, no effects were seen on maternal absolute or relative kidney weight, gravid uterine weight, numbers of implantation sites/litter, live or dead fetuses, resorptions, postimplantation loss/litter, litters with dead fetuses or fetal sex ratio in any of the groups. By analogy to the findings of the Domingo et al. (1989) and Gomez et al. (1991) studies, the lack of developmental effects of aluminum hydroxide at the tested dose could be related to low solubility and absorption.

In a more recent study, pregnant Swiss mice were administered gavage doses of 0 or 104 mg Al/kg bw-day as aluminum hydroxide on days 6-15 of gestation (Colomina et al., 1994). Dietary Al intake was not reported; e mice were maintained on Panlab rodent chow. Compared to controls, there were no effects ($p>0.05$) of Al maternal body or organ weight, number of implantations per litter, number of resorptions per litter, number or dead fetuses per litter, percentage of positive post-implantation loss, sex ratio or fetal body weight per litter. Gross external, visceral or skeletal examination of fetuses revealed no abnormalities or developmental variations. Thus, the NOAEL for development effects from this study is 104 mg Al/kg-day, however, this does not include the Al contribution from food. Thus, based on this study and the previous study (Colomina et al., 1992), aluminum lactate appears to be more potent as a developmental toxicant in mice than the less water soluble aluminum hydroxide.

Groups of 16 pregnant Swiss-Webster mice were fed 25 (control group), 500 or 1000 mg Al/kg diet as aluminum lactate throughout gestation and lactation (Donald et al., 1989). The control diet was fed to pups that were selected for post-weaning neurobehavioral assessment. Reported maternal doses were 5, 100 and 200 mg Al/kg bw-day at the beginning of pregnancy and 10.5, 210 and 420 mg Al/kg bw-day near the end of lactation. No mice were exposed to lactate alone. There were no treatment-related changes in maternal survival, body weight (measured on GD 0 and 16 and PDs 0, 5, 10, 15 and 20), food intake, toxic signs or neurobehavior (evaluated after pups were weaned at PD 21 using the same test battery used for the pups and described below), or on litter size or postnatal growth and development in pups as assessed by body weight, toxic signs on PDs 0-55, and by crown-rump length on PDs 0 and 20. Neurobehavioral maturation was tested in 2 pups per litter on PDs 8-18 with a 12 item test battery (fore- and hindlimb grasp, fore- and hindpaw placement on sticks of 2 widths, vibrissa placing, visual placing, auditory and air puff startle, eye opening, and screen grasp, cling and climb). A neurobehavioral test battery was administered to 6 pups per litter at age 25 days (4 days postweaning) or 39 days (fore- and hindlimb grip strengths, temperature sensitivity of tail, negative geotaxis, artle reflex to air puff and auditory stimuli) or age 21 and 35 days (foot splay). The pre-weaning robehavioral testing showed that a significant ($p=0.007$) number of pups in the high dose group had ...paired vertical screen climb performance. The postweaning neurobehavioral assessment showed significantly ($p<0.05$) altered performance on several tests. These included decreased forelimb grip strength at age 39 days in the low dose group, increased hindlimb grip strength at age 25 days in both low and high dose groups, increased foot splay distance at age 21 days in both low and high dose groups and at age 35 days in the low dose group, and increased forelimb grip strength at age 25 days and decreased thermal sensitivity at age 25 and 39 days in the high dose group. There were no treatment-related changes in concentrations of Al in pup liver or bone (brain tissue was not analyzed).

In a more recent study of similar design by the same group of investigators, groups of 14 and 9 female Swiss Webster mice (6-8 weeks old) were fed 25 (control) or 1000 mg Al/g diet as aluminum lactate, respectively, during gestation and lactation (Golub et al., 1992b). The 1000 mg/g concentration was selected based on the demonstration of neurobehavioral effects in weanlings at this level (Donald et al., 1989). No mice were exposed to lactate alone. Using food intake and body weight values estimated from reported data, maternal doses are estimated to be approximately 4.3 and 174 mg Al/kg bw-day at the beginning of gestation and 4.8 and 607 at the end of the lactation period. At birth, litters were fostered either within or between groups to provide 4 groups of offspring that were exposed to excess Al via maternal diet during gestation, lactation, both or neither (i.e., 25 ppm during gestation and lactation, 1000 ppm during gestation and 25 ppm during lactation, 25 ppm during gestation and 1000 ppm during lactation, and 1000 ppm during gestation and lactation). Maternal effects included significantly ($p\#0.015$) reduced (10-12%) body weight gain and food intake in the treated group during late pregnancy and lactation, and signs of neurotoxicity (hindlimb splaying

and dragging) in one treated dam at postnatal day 21 (weaning); this dam had seizures and died 4 days later. No treatment-related effects on litter size, birth weight, crown-rump length, righting ability at birth, sex ratio or postnatal survival were observed. Both gestation-only and lactation-only exposure caused significantly ($p<0.05$) decreased body weight gain in the treated pups beginning on postnatal day 10; combined gestation and lactation exposure produced the greatest decrease (approximately 24% at weaning). Neurobehavioral testing using the same battery as Donald et al. (1989) was performed at weaning on the dams and on a total of 12, 16, 12 and 6 pups (1 male and 1 female pup per litter) from the control, gestation-only, lactation-only and combined gestation and lactation groups, respectively. Results of this testing showed effects only in pups, including significantly decreased forelimb grip strength after gestation-only exposure, increased hindlimb grip strength after both gestation and lactation exposure, decreased temperature sensitivity after lactation-only exposure, and longer negative geotaxis latency after lactation-only exposure. In general, the findings of this study are consistent with those of Donald et al. (1989) in showing neurodevelopmental effects at the 1000 mg/kg dietary concentration, although intake dosages are dissimilar at the end of lactation. Using the dosage at the beginning of gestation, this study defines a LOAEL of 174 mg/kg-day for developmental effects.

The Donald et al. (1989) study differs from that of Golub et al. (1992b) in that offspring were not fostered, were tested at a later age (25 vs. 21 days), were allowed 4 days of recovery from the treated diet prior to testing, participated in other behavioral tests currently, and experienced no growth retardation. The effects found only in the cross-fostered groups in the Golub et al. (1992b) study (lower forelimb strength after gestation exposure and altered negative geotaxis latencies after lactation only exposure) were not observed by Donald et al. (1989). Increased footsplay was observed by Donald et al. (1989) but not by Golub et al. (1992b), perhaps due to an opposing effect of smaller pup body size in this study. Neither gestation or lactation exposure affected pup brain or liver Al concentrations, but lactation exposure caused significantly lower manganese and iron concentrations in liver and manganese concentrations in brain.

In a further extension of the two previous studies (Donald et al., 1989; Golub et al., 1992b), pregnant female Swiss-Webster mice were exposed continuously to a semi-purified diet containing 7 (control), 500 or 1000 mg Al/kg from the time of conception, through pregnancy and lactation (Golub et al., 1995). At weaning, pups were exposed to the same Al diet as their mothers (500 or 1000 mg Al/kg) until they were 150-170 days of age or were switched to the control diet (7 mg Al/kg) for the same time period. Based on reported dosages in previous studies by the same investigators, estimated daily dosages for mice exposed to 1000 mg Al/kg diet were as follows: 200 mg/kg bw-day in pregnant mice, 420 mg/kg-day in lactating mice and 130 mg/kg-day in offspring (Golub et al., 1994); doses for the mice exposed to 500 mg Al/kg diet were assumed to be approximately half of that of mice fed 1000 mg Al/kg, or 100 mg/kg-day in pregnant mice, 210 mg/kg-day in lactating mice and 65 mg/kg-day in offspring. Compared to the control diet, the Al diet had no effect on dam weight, gestation length, litter size, pup weight, offspring growth or organ weights. Operant conditioning (nose poke) of offspring for delayed spatial alternation or discrimination reversal tasks was initiated at 50 days of age and continued 5 days/wk for a total of 35 sessions. A neurobehavioral test battery was conducted when the offspring were 150-170 days of age (forelimb and hindlimb grip strength, temperature sensitivity, negative geotaxis, air puff and auditory startle response). Maternal and pre-weaning exposure to 500 mg Al/kg significantly affected ($p<0.05$) operant training in the offspring, but not performance after training in delayed spatial alternation or discrimination reversal tasks (i.e., decreased number of training sessions to achieve the training criteria). This exposure also significantly decreased forelimb and hindlimb grip strength and puff startle response ($p<0.05$). Pre-weaning and combined pre- and post-weaning exposure to 1000 mg Al/kg significantly increased ($p<0.05$) incidence of cagemate aggression at the time behavioral testing. No effects were observed on auditory startle response, temperature sensitivity, or negative geotaxis in offspring.

Histopathological examination of the brain and spinal cord revealed no treatment-related changes. Thus, the LOAEL for combined maternal and pre-weaning exposure on neurobehavioral effects in mice would approximate to 100 mg Al/kg-day (estimated daily maternal dosage).

Pregnant Charles River CD rats were administered gavage doses of 0, 250, 500 or 1000 mg Al/kg bw-day ("experiment A") or 0, 5, 25, 50, 250 or 500 mg Al/kg bw-day ("experiment B") as aluminum lactate in distilled water on GDs 5-15 (Agarwal et al., 1996). Dietary Al intake was not reported. Offspring were examined for body weight, anogenital distance, oestrus cycle regularity (after puberty), duration of pseudopregnancy induced by mechanical stimulation of the cervix, oocyte production induced by an injection of human chorionic gonadotropin, and male and female gonad weights. Aluminum had no effect on litter size and no consistent effects on birth weight were observed. For example, birth weights were decreased in male offspring from dams that received 250 mg Al/kg-day, but not at higher dosages, and the effect was observed only in experiment A. Female offspring birth weights decreased at certain dosage levels in experiment A and increased at these same dosage levels in experiment B. Similar inconsistencies between experiment A and B were observed for gonadal weights, anogenital distance, time to puberty (vaginal opening), duration of pseudopregnancy or numbers of superovulated oocytes. A significantly increased ($p<0.05$) number of abnormal oestrus cycle lengths (defined as less than 4 days or greater than 5 days) occurred in offspring from dams that received 250 mg Al/kg-day (in experiment A, the endpoint was not measured in experiment B). However, the effect was most pronounced in the first 3 oestrus cycles (of 5 observed) and not detected by the 5th cycle. Thus, the NOAEL for temporary disturbance of the oestrus cycle in offspring of dams administered Al is 250 mg Al/kg-day. NOAELs for all other reproductive endpoints in this study were 1000 mg Al/kg-day. These NOAELs do not include the contribution of Al in food.

In a three-generation study, Ondreicka et al. (1966) exposed initial groups of 7 female and 3 male Dobra oda mice to either 0 or 19.3 mg Al/kg bw-day as aluminum chloride in drinking water. The diet also tained 160 to 180 ppm Al, giving an estimated intake of 27-31 mg/kg-day based on default values for food sumption and body weight for chronic exposure of mice (U.S. EPA, 1988). Using this estimate, the total Al intakes (drinking water and food) were 27 mg/kg-day (controls) and 46.3 mg/kg-day (exposed group). The P_0 group produced 3 litters (designated F_{1a}, F_{1b}, and F_{1c}) and the F_{1a} group produced 2 litters (designated F_{2a} and F_{2b}) from which the weanlings were exposed to Al in the drinking water starting at 4 weeks of age. There were no difference in body weight gain among the groups in the P_0 generation, a result that contrasted with the striking decrease in this parameter in the treated F_{1b}, F_{1c}, F_{2a}, and F_{2b} groups. Though no effects on erythrocyte count, hemoglobin levels, or histopathology of the liver, spleen, and kidneys were observed in the P_0, F_1 or F_2 generations at the end of the study and no significant differences were seen in the number of litters or offspring between the exposed and control groups, the study identified a LOAEL of 46.3 mg Al/kg-day, based on the observed changes in body weight gain.

Other Toxicological Effects of Aluminum

In a study designed to determine the effects of oral Al exposure on susceptibility to bacterial infection, female Swiss-Webster mice (13-14 per group) were exposed to a diet containing 25 (control), 500 or 1000 mg Al/kg as aluminum lactate during pregnancy, through lactation and for 10 days following weaning of the pups (Yoshida et al., 1989). Based on reported dosages in previous studies by the same investigators, estimated daily dosages for mice exposed to 1000 mg Al/kg diet are as follows: 200 mg/kg-day during pregnancy and 420 mg/kg-day during lactation; doses for the mice exposed to 500 mg Al/kg diet are assumed to be approximately half of that of mice fed 1000 mg Al/kg, or 100 mg/kg-day in pregnant mice and 210 mg/kg-day in lactating

mice (Golub et al., 1994). At weaning, dams and pups were inoculated with a tail vein injection of *Listeria monocytogenes* and monitored for mortality for 10 days. In a separate experiment, female mice, 6 weeks of age, were exposed to the same dietary Al levels for six weeks and then inoculated with *L. monocytogenes.* Estimated Al dosages were 5, 98 or 195 mg Al/kg bw-day for the 25, 500 or 1000 mg Al/kg dietary levels, respectively, based on a default food factor of 0.195 kg diet/kg bw-day assuming a reference "subchronic" food intake and body weight for female B6C3F1 mice over the period from weaning to 90 days (U.S. EPA, 1988) . Inoculation resulted in significantly greater ($p<0.025$) mortality in dams exposed to 500 or 1000 mg Al/kg diet compared to controls. There were no differences in mortality between the groups of inoculated pups or between groups of inoculated adult mice exposed to Al for six weeks. The LOAEL for pregnant mice was 100 mg Al/kg bw-day and the NOAEL for adult, non-pregnant mice was 195 mg Al/kg bw-day. Although the exposure duration in this study was only 7 weeks, it is included in Table 1 because it provides the only dose-response data on the effects of Al on resistance to pathogens.

DERIVATION OF A PROVISIONAL CHRONIC ORAL RFD

This survey of the toxicological effects of Al in rodents suggests that neurotoxicological and developmental (including neurodevelopmental) endpoints are among the most sensitive indicators of Al toxicity. However, as vehicles for the development of toxicity values such as a provisional chronic RfD, the latter group of studies are considered to be more appropriate, since the level of exposure to Al appears to be better characterized. In fact, neurobehavioral deficits have been observed in mice and rats exposed during various stages of development and in subchronic studies (Bernuzzi et al., 1989; Donald et al., 1989; Golub et al., 1989, 1992a, 1992b, 1995; Muller et al., 1990), as described above. These deficits include impaired operant learning, changes in grip strength, altered startle response and impaired motor coordination. In addition, several studies have shown that oral Al can produce histopathological changes in the CNS, although the histopathological lesions have yet to be causally related to the neurobehavioral deficits. Thus, Florence et al. (1994) reported histopathological changes in the brain of rats exposed to dietary Al for 6 months, the changes including the appearance of vacuolation of the cell body and cell processes of astrocytes in the brain and swelling of astrocytic processes. In addition, more localized vacuolization of neurons in the brain also was observed. These changes were observed in rats exposed to elevated Al in the diet and are distinct from the NFD that has been observed in rats, rabbits and monkeys maintained on elevated dietary Al in combination with reduced dietary calcium (Garruto et al., 1989; Kihira et al., 1994; Mitani, 1992; Yano et al., 1989; Yoshida et al., 1990) or in rabbits administered intracisternal or intraventricular injections of Al (Kowall et al., 1989; Wakayama et al., 1993). Interpretation of the low-calcium studies is complicated by the observation that NFD was observed in animals maintained on low-calcium diets without excess Al and was enhanced by the addition of excess Al to these diets (Garruto et al., 1989; Kihira et al., 1994). Furthermore, Al has been shown to inhibit the gastrointestinal absorption of calcium (Orihuela et al., 1996), an effect that may exacerbate the calcium deprivation induced by low calcium diets. Thus, it is not clear whether calcium deprivation enhances the neurotoxicity of Al or Al exacerbates the adverse effects of calcium deprivation.

Donald et al. (1989) and Golub et al. (1995) are co-principal studies that identify a LOAEL of 100 mg Al/kg-day for minimal neurotoxicity in the offspring of mice exposed to dietary aluminum lactate (soluble aluminum) during gestation and lactation. The neurotoxicity associated with this LOAEL is consistent with LOAELs from other developmental and subchronic neurobehavioral studies in mice and rats which used higher dietary dosages of aluminum lactate or aluminum chloride (Golub et al., 1989, 1992a, 1992b; Bernuzzi et al., 1989; Muller et al., 1990). Of the above, Golub et al., (1995) is the only study in which a histopathological examination of the brain and spinal cord was conducted and no abnormalities were reported. The Florence et al.

(1994) study indicates that histopathological abnormalities of the CNS can occur in rats exposed subchronically to 84 mg/kg-day; although this is lower than the LOAEL for neurobehavioral effects, it was not chosen as the principal study because the functional significance of the histopathological lesions are uncertain.

A number of studies were identified that, at face value, appeared to indicate LOAELs at lower doses than the 100 mg Al/kg-day value selected herein, for example, Patermain et al. (1988) and Colomina et al. (1992). However, in these as in many of the studies under consideration, insufficient information on dietary Al (Al content and/or feed type) was reported to permit a reliable estimation of the overall dose level to which the animals were subjected.

Other developmental studies with aluminum hydroxide and/or citrate in mice and rats identified a NOAEL which are equivalent (95.5 mg Al/kg-day) to, or a minimum LOAEL that was greater (133 mg Al/kg-day) than the 100 mg Al/kg-day critical LOAEL (Domingo et al., 1989; Gomez et al., 1991), an overlap potentially related to differences in effective doses due to variations in unreported Al dietary content and factors affecting absorption such as chemical form (e.g., the use of less absorbable aluminum hydroxide). In addition, the LOAEL of 43.3 mg Al/kg-day for decreased body weight gain in mice exposed to aluminum chloride for 180-390 days (Ondreicka et al., 1966) was thought be inappropriate for risk assessment due to the small sample size and to the poor reporting of study details. Aluminum nitrate caused alterations in levels of brain biogenic amines and hepatic and hematological indices in rats exposed to 21.4 mg Al/kg-day for 6 weeks (Flora et al., 1991). This dose is a NOAEL because insufficient information is available to determine if the effects are adverse.

Therefore, the LOAEL of 100 mg Al/kg-day for minimal neurotoxicity in the offspring of mice (Donald et al., 1989, Golub et al., 1995) is selected as the basis for the provisional chronic RfD. The LOAEL is considered minimal because the results of the postweaning neurobehavioral test battery indicate that performance deficits may be marginal. In particular, of the three observed effects (decreased forelimb and increased hindlimb grip strengths, increased hindlimb foot splay distance), one effect (increased grip strength) has unclear toxicological significance and two effects (increased grip strength and foot splay distance) did not persist after two weeks of no further exposure.

Application of an uncertainty factor (UF) of 100 (3 for use of a minimal LOAEL, 10 for interspecies extrapolation, and 3 for intrahuman variability where the critical effects have been observed in a sensitive subgroup) results in a provisional RfD of

RfD = 1E-0 mg Al/kg-day.

The provisional RfD of **1E-0** mg Al/kg-day is approximately 3-fold higher than estimated normal daily Al intake of approximately 0.2-0.3 mg/kg-day (Iyengar et al., 1987; Ganrot, 1986; Wilhelm et al., 1990). Chronic users of medications such as antacids, buffered aspirins and antiulceratives would be expected to ingest much larger amounts of Al, possibly as high as 10-70 mg/kg-day. However, these subjects would not represent the most sensitive population (developing infants), as indicated by the animal data.

Low confidence is placed in the co-critical studies, because they only identify a LOAEL for a sensitive effect and evaluated comparatively small numbers of animals. Confidence in the data base is low because the most reliable supporting data for neurotoxicity of Al in humans are of limited general relevance (e.g., dialysis encephalopathy is manifested in patients with impaired renal function and excessive Al uptake from intravenous

exposure). In fact, neurotoxicity remains to be assessed in animals chronically exposed to Al, and developmental morphology has not been adequately investigated in two animal species. These limitations in the Al data base do not increase uncertainty in the RfD; therefore, a data base uncertainty factor was not used. However, reflecting the low confidence in the co-critical studies, there is low overall confidence in the RfD.

RISK CHARACTERIZATION

Cancer Hazard Summary There are no records for Al in the U.S. EPA's IRIS or HEAST databases (U.S. EPA, 1999, 1997), nor has the carcinogenicity of Al compounds been formally evaluated by the agency. However, a number of scientific investigations have addressed the issue of the carcinogenicity of Al, though with inconclusive results. For example, a 20-month exposure of B6C3F1 mice to aluminum potassium sulfate dodecahydrate in the diet at concentrations up to 10% w/w displayed no indication of compound-related carcinogenicity and, in general, no indication of adverse toxicological effects of any kind (Oneda et al., 1994). Similarly, the life-time exposure of Swiss mice and Long-Evans rats to 5 ppm Al as aluminum potassium sulfate in drinking water provided no convincing evidence for the carcinogenicity of Al compounds (Schroeder and Mitchener 1975a,b). A considerable number of epidemiological studies have examined the incidence of excess tumor formation in persons occupationally exposed to Al in the form of dusts or fumes. In general, a body of inferential evidence exists for an increase in cancer of the bladder and lung with occupational exposure to Al, though conclusions linking cause with effect are frequently confounded by co-exposure to other harmful emissions, cigarette smoking, and the absence of adequate reference populations. Taking all of the evidence of Al carcinogenicity together, a qualitative weight-of evidence classification of D, -not classifiable as to human carcinogenicity, is suggested, in line with the agency's guidelines for carcinogenic risk assessment (U.S. EPA, 1986). In accordance with the agency's proposed guidelines for carcinogenic risk assessment (U.S. EPA, 1996), the compound's carcinogenicity *cannot be determined* on the available evidence.

SUPPORTING INFORMATION

Human Data Occupational exposure to fumes and dusts containing Al compounds, for example, in welding shops, has provided insubstantial evidence of links to increased tumor incidence, in some studies. Overall, the links between cause and effect are considered marginal, at best, and are potentially by co-exposure to other carcinogenic substances.

Animal Data Studies of the carcinogenicity of Al compounds in experimental animals have yielded negative results.

Mutagenicity The small amount of evidence that exists on the capacity of the element to induce gene reversion in *S. typhimurium* is negative for Al compounds (Ahn and Jeffrey, 1995).

MODE OF ACTION

No data.

DISCUSSION

Epidemiological studies of metal dusts and fumes in such settings as welding shops, smelters, etc., have provided a body of evidence that suggests but does not prove that emissions containing a number of air-borne l may be carcinogenic. However, the evidence for such a proposition is weak, yielding data on the border- : of statistical significance, if at all. There is no hard evidence for the carcinogenicity of Al compounds via the oral route.

BRIEFING SUMMARY

Routes	Class	Designation or Rationale	Dose Response
oral/inhalation	cannot be determined	not applicable	no data

Basis for classification/dose response

1. **Human data:** Insufficient evidence in epidemiological/occupational exposure studies.

2. **Animal data:** Existing evidence is largely negative for Al's carcinogenicity.

3. **Structural analogue data:** None.

4. **Other key data:** Available mutagenicity data are negative for Al compounds.

5. **Mode of action:** No data.

6. **Hazard classification/uncertainties:** The chosen weight-of-evidence descriptors are based on a lack of sufficiently hard evidence for the carcinogenicity of Al compounds. Positive evidence of non-carcinogenicity is also lacking.

7. **Dose response:** Not applicable

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Table 1. Summary of Oral Toxicity Data for Aluminum[1]										
Study	Type	Species	Al	Exposure Concentration (ppm)	Exposure Dosage (mg Al/kg-day)	Exposure Frequency and Duration	Critical Effect	NOAEL (mg Al/kg-day)	LOAEL (mg Al/kg-day)	FEL (mg Al/kg-day)
Ondreicka et al., 1966	Subchronic 3-gen dietary	Dobra Voda mice	chloride	--	27 (control), 46	Continuous, 180-390 day	Decreased body weight gain in F1 and F2.	--	46	--
Golub et al., 1989	Subchronic dietary	S-W mice	lactate	25 (control), 500,1000	3.3 (control), 65,130	Continuous, 6 wk	Decreased spontaneous motor activity; decreased weight gain.	65	130	--
Golub et al., 1992a	Subchronic dietary	S-W mice	lactate	25 (control), 1000	190	Continuous, 90 day	Decreased hindlimb grip, decreased spontaneous motor activity, decreased startle response.	--	190	--
Florence et al., 1994	Subchronic dietary	Wistar rat	chloride (with citric acid)	1.52 (control), 1000	0.13 (control), 84	Continuous, 6 mo.	Histopathological changes in brain astrocytes and neurons.	--	84	--
Domingo et al., 1996	Subchronic drinking water	Sprague Dawley rats	nitrate (with citric acid)	--	0, 50, 100 (plus unreported dietary Al)	Continuous, 6.5 mo.	Operant conditioning and performance	100	--	--
Yoshida et al., 1989	Subchronic dietary	S-W mice	lactate	25 (control), 500, 1000	5 (control), 98, 195	Continuous, 7 wk	Increased mortality from L. monocytogenes inoculation	195	--	--
Donald et al., 1989	Developmental dietary	S-W mice	lactate	25 (control), 500, 1000	5 (control), 100, 200	Continuous, gestation and lactation	Neurobehavioral effects.	--	100	--
Golub et al., 1992b	Developmental dietary	S-W mice	lactate	25 (control), 1000	4 (control), 174	Continuous, gestation and lactation	Neurobehavioral effects.	--	174	--
Golub et al., 1995	Developmental dietary	S-W mice	lactate	7, 500, 1000	1 (control), 100, 200	Continuous, gestation, lactation to maturity	Neurobehavioral effects.	--	100	--
Yoshida et al., 1989	Developmental dietary	S-W mice	lactate	25 (control), 500, 1000	4 (control), 100, 200	Continuous, gestation and lactation	Increased mortality of dams from L. monocytogenes inoculation	--	100	--

[1]Studies for which total dosages were reported or could be estimated (unless otherwise noted).

Attachment 4

SRC SF 01-021c/11-14-01

Risk Assessment Issue Paper for:
Evaluation of the Carcinogenicity Assessment for
Iron (CASRN 7439-89-6) and Compounds

INTRODUCTION

A cancer assessment for iron is not listed on IRIS (U.S. EPA, 2001), the HEAST (U.S. EPA, 1997), or the Drinking Water Standards and Health Advisories list (U.S. EPA, 2000), and was not considered by the CRAVE Work Group (U.S. EPA, 1995). The CARA list (1991, 1994) includes a Health Effects Assessment for Iron and Compounds (U.S. EPA, 1984) that assigned iron and its compounds to weight-of-evidence Group C, possible human carcinogen. This assessment was based on conflicting evidence of lung tumors following occupational inhalation exposure to ferric oxide (mixed exposure), and injection-site tumors in one patient and in mice treated with iron-dextran. IARC (1972, 1987) assigned ferric oxide to Group 3, not classifiable as to its carcinogenicity to humans based on inadequate data in humans (increased incidence of lung cancer following occupational exposure to iron dusts in mixtures) and apparently negative evidence for carcinogenicity in mice, hamsters and guinea pigs exposed by inhalation or intratracheal instillation. For ferric oxide dust and fume, the ACGIH (1991, 2001) lists an A4 notation, not classifiable as a human carcinogen; this is based on mixed exposure studies in humans and primarily negative studies in animals.

Iron has not been the subject of a toxicological review by ATSDR (2001) or the WHO (2001). Monographs by IARC (1972, 1984, 1987), a toxicity review on iron (Grimsley, 2001), and the NTP (2001a, 2001b) management status report and chemical repository summary were consulted for information relevant to the carcinogenicity of iron and inorganic iron compounds. The following computer searches, performed in April, 1993, were screened to identify additional pertinent studies not discussed in review documents: TOXLINE (1983-April, 1993), CANCERLIT (1990 - April, 1993), MEDLINE (1991 - April, 1993), TSCATS, RTECS, and HSDB. Update literature searches were conducted in September, 2001 in TOXLINE (1992-September, 2001), CANCERLIT (1992- September, 2001), MEDLINE (1992-September, 2001), TSCATS, RTECS, DART/ETICBACK, EMIC/EMICBACK, HSDB, GENETOX, and CCRIS.

REVIEW OF PERTINENT LITERATURE

Human Studies

Oral Exposure

Since iron is an essential element, the NAS (2001) has established guidelines for daily dietary intakes, based on gender, age, and physiological status, that are designed to avoid adverse effects of deficiency and excess. Individuals of northern European descent who are affected by hereditary hemochromatosis, an autosomal, recessive disorder, are not protected by these guidelines. These individuals exhibit excessive absorption of dietary iron, which results in abnormally high accumulations of iron in the tissues. When the liver consequently develops cirrhosis, the risk of developing primary hepatocellular carcinoma increases significantly. It is not clear whether these findings are relevant to excess iron intake by the general population.

Bird et al. (1996) investigated the association between plasma ferritin and iron intake and the development of adenomatous polyps, which are intermediate markers for colorectal cancer. The study population consisted of men and women between the ages of 50 and 75 years old who underwent routine screening by flexible sigmoidoscopy at one of two medical centers during 1991-1993. Individuals with cancer, inflammatory bowel disease, or familial polyposis were excluded. Cases (300 men and 167 women) were subjects diagnosed for the first time with one or more histologically confirmed adenomatous polyps. Controls (331 men and 167 women) had no history of polyps and none discovered at sigmoidoscopy. Cases and controls were matched by sex, age (" 5 years), date of sigmoidoscopy (" 3 months), and medical center. Plasma ferritin levels, hematocrit, and certain nutritional indicators (carotenoids, ascobate, folate) were measured in blood samples drawn 6 months after examination. Iron intakes for the year preceding sigmoidoscopy were estimated by means of a semiquantitative food frequency questionnaire. After excluding subjects with possible non-iron-related elevations in ferritin, subjects with high plasma ferritin levels (>289 : g/L) had a multivariate-adjusted odds ratio for colorectal polyps of 1.5 (95% confidence interval (C.I..) 1.0-2.3) compared to subjects with low/normal levels (73-141 : g/L). The pattern for iron intake was U-shaped. Compared with subjects consuming an adequate amount of iron (11.6-13.6 mg/day), multivariate-adjusted odds ratios for colorectal polyps were 1.6 (95% C.I. 1.1-2.4) for intakes below 11.6 mg/day and 1.4 (95% C.I. 0.9-2.0) for intakes above 27.3 mg/day. The authors conclude that there is a weak positive association between iron exposure and colorectal polyps that may increase the risk of colorectal cancer.

Inhalation Exposure

Most studies of cancer incidence following occupational exposure to iron dust are excluded from consideration because of confounding exposures to silica, radon daughters, soot, asbestos, or other types of metals in the study populations (U.S. EPA, 1984; IARC, 1972, 1984, 1987).

A case-control study examined cancer incidence in a Swedish male worker population (1958-1971) with a high exposure to iron oxides from the production of sulfuric acid from pyrite (FeS_2) (Axelson and Sjöberg, 1979). The workers were exposed to iron oxide (Fe_2O_3) along with 1-2% copper, 0.01-0.1% arsenic, nickel and cobalt as impurities. Exposure in the workroom was estimated as approximately 50-100 mg/m^3, and the particle size as 25% below 10 : m and 5-10% below 5 : m. No cases of siderosis were known from the plant. The Swedish National Cancer Register was consulted for locating cases of cancer that could have been caused by environmental exposure; the study examined cancers of the stomach, liver, lung, kidney, and bladder, and hematological malignancies. Each cancer case was matched with two controls from the local population register by matching for sex, age, and residency in the same or adjacent neighborhood block. Company files were searched to determine the length of exposure; those with less than 5 months of exposure were considered to be nonexposed. The study found no association between exposure to iron oxides and any of the selected types of cancer.

Animal Studies

Oral Exposure

Groups of F344 rats (50 per sex per group) were given ferric chloride ($FeCl_3 \cdot 6H_2O$) in drinking water at concentrations of 0, 0.25, or 0.5% (weight/volume) for 104 weeks, and then given distilled water for an 8 week recovery period (Sato et al., 1992). The intake of ferric chloride was reported to be 0, 169.7, or 319.7 mg/kg-day for males and 0, 187.9, or 336.0 mg/kg-day for females. The iron intakes were 0, 58.4, or 110 mg/kg-day in males and 0, 64.6, or 115.6 mg/kg-day in females. Rats were observed daily for clinical signs and mortality. Body weights were measured once a week for 13 weeks and every fourth week thereafter. All rats dying prematurely and survivors at week 112 were examined for gross and microscopic neoplastic and non-neoplastic lesions. There were dose-related decreases in drinking water intake and

terminal body weight in both sexes. These may have been related to reduced palatability. Survival in both sexes was not significantly affected by exposure to ferric chloride. No increases in tumor incidence were observed in rats exposed to ferric chloride for two years.

Inhalation Exposure

Groups of male Syrian hamsters (132 per group) were exposed to filtered air or Fe_2O_3 (analytic grade) dust at a concentration of 40 mg/m^3, 6 hours/day, 5 days/week for life (Nettesheim et al., 1975). The particle size had a geometric mean diameter of 0.11 : m. In addition, two satellite groups (15 hamsters per treatment) were sacrificed, three animals at a time, at 2, 4, 8, 12, and 104 weeks, so that the accumulation of iron in the lung from inhaled Fe_2O_3 could be compared to background iron concentrations in heme. The animals were examined daily, before and after each exposure, for clinical signs; body weights were recorded monthly. All animals except those cannibalized (<2%) were necropsied. Histological analyses were performed for the major organs, including heart, trachea, lungs, and nasal cavities. Examination of the satellite groups demonstrated a gradual increase in iron accumulation in the lung, reaching a total of 10 mg per lung at 104 weeks. Exposure to Fe_2O_3 had no effect on survival or body weight gain and did not increase the incidence of tumors. The authors concluded that inhalation of Fe_2O_3 was not carcinogenic to hamsters.

Groups of Syrian golden hamsters (24 per sex per group) received intratracheal instillations of 0 or 3 mg[1] of Fe_2O_3 dust in 0.2 ml of saline once a week for 15 weeks, and then were observed up to week 120 (Stenbäck et al., 1976). Analysis by the sedimentation method demonstrated that 98% of the particles were less than 10 : m in diameter. Animals were weighed weekly and autopsied. Organs with gross lesions and the larynx, trachea, bronchi, and lungs were examined histologically. Treatment with ferric oxide had no effect on survival and did not affect body weight except during the final weeks of survival (data not shown). Treatment did not induce tumors of the respiratory tract and the incidence of forestomach papillomas in the treatment group was less than in the control group.

Other Studies

Genotoxicity

Genotoxicity assays of inorganic iron salts were primarily negative in bacteria, but were more often positive in mammalian systems. Iron did not induce reverse mutations in *Salmonella typhimurium* strains TA98, TA102, TA1535, or TA1537, with or without activation (Wong, 1988). Ferric chloride and ferrous sulfate tested negative in strains TA98, TA100, TA1535, TA1537, and TA1538 with or without metabolic activation (Shimizu et al., 1985; Dunkel et al., 1999). Ferrous sulfate also tested negative in strains TA97 and TA102, with or without activation (Fujita et al., 1994), but positive in TA1537 and TA1538 (U.S. EPA, 1984). Ferrous and ferric chloride did not induce DNA repair in *Bacillus subtilis* (rec assay) (Leifer et al., 1981). Ferrous sulfate increased the frequency of mutations at the TK locus of mouse L5178Y lymphoma cells, with or without metabolic activation, but only at high concentrations; ferric chloride only increased the frequency of TK mutations when tested with metabolic activation (Dunkel et al., 1999). Ferrous sulfate did not induce sister chromatid exchanges *in vitro* (Ohno et al., 1982). DNA-protein cross-links were generated in mammalian cells cultured in the presence of ferrous iron (Altman et al., 1995). Single- and double-strand DNA breaks were produced in supercoiled plasmid DNA (Toyokuni and Sagripanti, 1992) and in isolated rat liver nuclei (U.S. EPA, 1984) treated with ferrous or ferric chloride. No breakage was detected electrophoretically in Chinese hamster ovary cell DNA treated with ferrous chloride (U.S. EPA, 1984). In a model of oxidative damage within cells, ferrous sulfate, in the presence of hydrogen peroxide, was

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[1]The authors characterized the treatment as a 'maximum dose of 3 mg'. It is not clear whether the hamsters received lower doses on some occasions.

demonstrated to induce double-strand breaks and intra-strand cross-links in DNA *in vitro* (Lloyd and Phillips, 1999).

Cell transformation

Iron compounds have yielded variable results in studies of cell transformation *in vitro*. Particles of magnetite (Fe_3O_4) induced transformation of cultured a Chinese hamster lung cell line (V_{79}), but only at cytotoxic concentrations (Elias et al., 1995). Ferrous chloride and ferrous sulfate induced cell transformation in viral-enhanced Syrian hamster embryo (SA7/SHE) cells (U.S. EPA, 1984).

Mechanistic Studies

Adverse effects of iron are thought to be related to the formation of reactive oxygen species via the Fenton reaction (Henle and Linn, 1997). Hydrogen peroxide can react with ferrous ion, resulting in the conversion to ferric ion and the production of hydroxyl radicals. Ferric ion can also react with hydrogen peroxide, producing superoxide radical. Reactive oxygen species may react with DNA.

PROVISIONAL WEIGHT-OF-EVIDENCE CLASSIFICATION

U.S. EPA (1984) classified iron and its compounds, including ferric dextran, as a possible human carcinogens (Group C). This assessment was based on reports associating an increased incidence of lung cancer with exposure to hematite dust (confounded by coincident exposures to tobacco, alcohol, silica, soot, and fumes of other metals), inconsistent reports of lung tumors in animals exposed by inhalation or tracheal instillation to ferric oxide, and reports of injection site tumors in one patient injected with iron dextran and in mice injected with iron dextran or saccharated iron oxide. The current issue paper excludes organic forms of iron and studies in which the levels of impurities are significant.

Results of the case-control study by Bird et al. (1996) provide evidence of a weak association between elevated iron intake or high plasma ferritin (a measure of body stores) and the prevalence of adenomatous colorectal polyps, a possible precursor to colorectal cancer. Weaknesses of this study include the 6-month period between examination and ferritin measurements, and the possible recall errors affecting the dietary questionnaire for the previous year. Although the association between cirrhotic hereditary hemochromatosis and hepatocellular carcinoma is well established, the evidence for dietary iron intake and hepatic cancer in the general population was characterized by the NAS (2001) as inconclusive. In a chronic rat assay, Sato et al. (1992) found no evidence of carcinogenicity of ferric chloride ingested in drinking water at concentrations up to 0.5%. In summary, the evidence for carcinogenicity of ingested inorganic iron compounds in humans and animals appears to be inadequate.

Evidence from the case-control study of Axelson and Sjöberg (1979) suggests that inhaled iron oxide may not be carcinogenic to humans. However, uncertainty remains because levels of exposure were not measured, the durations of exposure were not reported, and individuals exposed for up to 5 months were categorized as 'nonexposed.' In addition, the lack of reported cases of siderosis in the workplace suggests that the exposure levels may have been lower than estimated. Thus, the evidence for carcinogenicity of inhaled iron oxide in humans is considered inadequate. Results of the study of Nettesheim et al. (1975) indicate that chronic inhalation exposure to iron oxide at a concentration of 40 mg/m^3 is not carcinogenic to hamsters. This finding is supported by the negative results for carcinogenicity of iron oxide administered by intratracheal instillation to hamsters for 15 weeks (Stenbäck et al., 1976). However, as both hamster studies used single exposure concentrations, the possibility of carcinogenicity at higher exposure levels cannot be disregarded.

Based on these data, and genotoxicity results that were primarily negative (albeit positive for DNA strand breaks in mammalian systems), iron and inorganic iron compounds are most appropriately placed in U.S. EPA (1986) Weight-of-Evidence Group D - not classifiable as to human carcinogenicity. Following the U.S. EPA (1996, 1999) proposed guidelines for carcinogen risk assessment, the available data are inadequate for an assessment of the human carcinogenic potential of inhaled iron oxide or ingested iron chloride.

QUANTITATIVE ESTIMATES OF CARCINOGENIC RISK

Derivation of quantitative estimates of cancer risk for ingested or inhaled iron or iron oxide is precluded by the absence of adequate data demonstrating carcinogenicity.

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Attachment 5

SRC SF 01-021b/11-14-01

Risk Assessment Issue Paper for:
Feasibility of Deriving a Provisional RfC for
Iron (CASRN 7439-89-6)and Compounds

INTRODUCTION

An RfC for iron is not listed on IRIS (U.S. EPA, 2001) and was not considered by the RfD/RfC Work Group (U.S. EPA, 1995). The HEAST (U.S. EPA, 1997) reported that data regarding iron were inadequate for quantitative risk assessment. The CARA list (1991, 1994a) includes a Health Effects Assessment for Iron and Compounds (U.S. EPA, 1984) that reported negative epidemiological studies (no association between excess mortality or respiratory diseases and occupational exposure to iron oxide dusts) and no available subchronic or chronic inhalation studies in animals.

Occupational exposure limits have been established for soluble iron salts and iron oxide, as well as for organic iron compounds not covered in this issue paper. The ACGIH (1991a, 2001) has adopted a TLV-TWA, NIOSH (2001a) has established a REL-TWA, and OSHA (2001a, 2001b) has adopted a construction industry PEL-TWA of 1 mg/m^3, as Fe, to reduce the likelihood of irritation to eyes, skin, and respiratory tract from exposure to aerosols or mists of soluble iron salts (ferrous and ferric sulfates and chlorides, and ferric nitrate). The ACGIH (1991b, 2001) has adopted a TLV-TWA and NIOSH (2001b) has established a REL-TWA of 5 mg/m^3, as Fe, for dust and fume of ferric oxide (Fe_2O_3) to protect against siderosis, a benign pneumoconiosis. OSHA (2001c) has adopted a PEL-TWA of 10 mg/m^3 for ferric oxide fume, to protect against accumulation of iron dust in the lungs.

Iron has not been the subject of a toxicological profile by ATSDR (2001) or the WHO (2001). Monographs by IARC (1972, 1984, 1987), a toxicity review on iron (Grimsley, 2001), and the NTP (2001a, 2001b) management status report and chemical repository summary were consulted for information relevant to inhalation toxicity of iron and inorganic iron compounds. The following computer searches, performed in April, 1993, were screened to identify additional pertinent studies not discussed in review documents: TOXLINE (1983-April, 1993), CANCERLIT (1990 - April, 1993), MEDLINE (1991 - April, 1993), TSCATS, RTECS, and HSDB. Update literature searches were conducted in September, 2001 in TOXLINE (1992-September, 2001), CANCERLIT (1992- September, 2001), MEDLINE (1992-September, 2001), TSCATS, RTECS, DART/ETICBACK, EMIC/EMICBACK, HSDB, GENETOX, and CCRIS.

REVIEW OF PERTINENT LITERATURE

Human Studies

A number of studies have examined the relationship between respiratory disease and inhalation exposure to iron compounds for workers employed in hematite mining or other iron-related occupations, such as welding or steel-making (U.S. EPA, 1984; IARC, 1972, 1984; Grimsley, 2001). However, since these studies involved concurrent exposure to silica and other metals, they are not suitable for the health risk assessment of iron or iron compounds. The literature search did not discover any studies that examined subchronic or chronic inhalation exposures of humans to quantified levels of iron or iron compounds alone.

In a case-control study of cancer incidence, a Swedish male worker population (1958-1971) was reported to have had a high exposure to iron oxides from the production of sulfuric acid from pyrite (FeS_2)

(Axelson and Sjöberg, 1979). The workers were exposed to iron oxide (Fe_2O_3) along with 1-2% copper, 0.01-0.1% arsenic, nickel and cobalt as impurities. Exposure in the workroom was estimated as approximately 50-100 mg/m^3, and the particle size as 25% below 10 : m and 5-10% below 5 : m. However, there were no measurements of exposure levels or particle size, and exposure durations were not reported. No cases of siderosis were known from the plant.

Animal Studies

Inhalation studies for iron compounds in animals include a chronic study of hamsters exposed to ferric oxide (Fe_2O_3) dust (Nettesheim et al., 1975) and a 2-month study in rabbits exposed to aerosols of ferric chloride (Johansson et al., 1992).

In a cancer study, groups of male Syrian hamsters (132 per group) were exposed to filtered air or Fe_2O_3 (analytic grade) dust at a concentration of 40 mg/m^3, 6 hours/day, 5 days/week for life (Nettesheim et al., 1975). The particle size had a geometric mean diameter of 0.11 : m. In addition, two satellite groups (15 hamsters per treatment) were sacrificed, three animals at a time, at 2, 4, 8, 12, and 104 weeks, so that the accumulation of iron in the lung from inhaled Fe_2O_3 could be compared to background iron concentrations in heme. The animals were examined daily, before and after each exposure, for clinical signs, and body weights were recorded monthly. All animals except those cannibalized (<2%) were necropsied. Histological analyses were performed on the major organs, including heart, trachea, lungs, and nasal cavities. Examination of the satellite groups demonstrated the gradual increase in iron accumulation in the lung, reaching a total of 10 mg per lung at 104 weeks. Histological examination revealed iron deposits in the lungs and tracheal and bronchial lymph nodes of all exposed animals. Diffuse and focal alveolar fibrosis was also frequently observed in the lungs of treated animals. Results for the histological endpoints were not reported quantitatively. In this study, 40 mg/m^3 is a LOAEL for respiratory effects (alveolar fibrosis) in hamsters exposed to Fe_2O_3 dust.

Groups of 8 male rabbits (strain not reported) were exposed to aerosols of 0, 1.4, or 3.1 mg/m^3 of iron as $FeCl_3$ 6 hours/day, 5 days/week for 2 months (Johansson et al., 1992). At termination, the upper left lung lobe was examined by light microscopy, pieces of the lower left lung were analyzed by electron microscopy or used for phospholipid analysis, and the right lung was lavaged to obtain macrophages for morphological and functional analyses. The mass median aerodynamic diameter of the aerosols was ~1 : m as measured with an impactor. Treatment had no effect on survival. Lungs were spotted with black in 7/8 high-iron rabbits, in 2/8 low-iron rabbits, and in 0/8 controls. The absolute weight of the left lower lobe of the lung was significantly elevated compared to controls in the high-iron group. Exposure-related histopathology was observed in the lungs. In the high-exposure group, the lungs contained naked granulomas [large nodules ($1 mm) of densely packed granular macrophages], accumulations of granular macrophages in terminal bronchioles, and foci of interstitial lymphocytic inflammatory reaction. Small granulomas were observed in one low-iron and one control rabbit. Accumulations of normal and granular macrophages were observed in the alveoli of exposed rabbits. In the control group, normal lung tissue contained some small accumulations of macrophages with occasional small inflammatory reaction. The high exposure group had a significantly higher density of alveolar type II cells than the controls. Ultrastructural analysis of macrophages showed a significantly higher number of abnormal cells, cells with enlarged lysosomes, and black inclusions in cells in both exposed groups; the high-iron group had higher percentages of cells with laminar inclusions or with smooth cell surfaces. In functional tests, macrophages from the high-exposure group showed significantly elevated phagocytic activity, but no significant increase in oxidative metabolic activity (superoxide generation). Total phospholipids were elevated in the high-exposure group, but, as indicated by the lack of increase in phosphatidyl cholines or the percentage of 1,2-dipalmitoylphosphatidylcholine, the amount of surfactant was unchanged. In this study, the low concentration of 1.4 mg/m^3 is a NOAEL and the high concentration of 3.1 mg/m^3 is a LOAEL for adverse lung effects (nodular granulomas $1 mm in diameter, abnormal macrophages) in rabbits exposed to ferric chloride aerosols. Because of its focus on alveolar

macrophage effects, this study provided no information regarding clinical signs of toxicity, body weight changes, clinical biochemistry, nasopharyngeal effects or histology of any other tissue besides the lung.

Other Studies

In a cancer study, groups of Syrian golden hamsters (24 per sex per group) received intratracheal instillations of 0 or "a maximum dose"[2] of 3 mg of Fe_2O_3 dust in 0.2 ml of saline once a week for 15 weeks, and then were observed up to week 120 (Stenbäck et al., 1976). Analysis by the sedimentation method demonstrated that 98% of the particles were less than 10 : m in diameter. Animals were weighed weekly and autopsied. Organs with gross lesions and the larynx, trachea, bronchi, and lungs were examined histologically. Treatment with ferric oxide had no effect on survival and no effect on body weight except during the final weeks of survival (data not shown). Deposited iron oxide was grossly visible as dark patches on the lung surface. Histologically, dust accumulations surrounded by cellular infiltrates were observed in the peribronchial region. Interstitial fibrosis was observed occasionally, but distinct inflammatory changes were rare. Results for the nonneoplastic endpoints were not reported quantitatively.

FEASIBILITY OF DERIVING A PROVISIONAL RfC FOR IRON

No adequate human or animal inhalation data are available for exposure to iron or inorganic iron compounds. The epidemiological study of Axelson and Sjöberg (1979) did not provide quantitative measures of exposure and did not characterize noncancer endpoints. Although Nettesheim et al. (1975) reported diffuse and focal alveolar fibrosis in the lungs of hamsters chronically exposed to iron oxide by inhalation at a concentration of 40 mg/m^3, the lack of incidence data prevents an evaluation of the significance of these findings. The subchronic study of Johansson et al. (1992), in which rabbits were exposed to aerosols of ferric chloride for 2 months, demonstrated a NOAEL of 1.4 mg/m^3 and a LOAEL of 1 mg/m^3 for respiratory effects (granuloma nodules greater than 1 mm diameter in the lungs). However, this study does not meet the minimum standards for an inhalation bioassay as stipulated by the U.S. EPA (1994b) guidelines for derivation of an inhalation reference concentration. Inadequacies of the study include relatively small group sizes, relatively short study duration, and the failure to examine a sufficient array of endpoints. Thus this study is inadequate for the purposes of deriving an RfC for iron.

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[2]The authors provided no further information regarding dosage. It is not clear whether animals were given amounts lower than 3 mg on some occasions.

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Risk Assessment Issue Paper for:
Derivation of the Provisional RfD for Iron (CASRN 7439-89-6) and Compounds

INTRODUCTION

An RfD for iron is not available on IRIS (U.S. EPA, 2001) or the Drinking Water Standards and Health Advisories list (U.S. EPA, 2000), and was not discussed by the RfD/RfC Work Group (U.S. EPA, 1995). The HEAST (U.S. EPA, 1997) reported that data regarding iron were inadequate for quantitative risk assessment. The CARA list (1991, 1994) includes a Health Effects Assessment for Iron and Compounds (U.S. EPA, 1984) that found no reliable quantitative oral toxicity data. Iron has not been the subject of a toxicological review by ATSDR (2001) or the WHO (2001). Monographs by IARC (1972, 1987), toxicity reviews by Jacobs (1977), Bothwell et al. (1979), Lauffer (1991), and Grimsley (2001), a review on dietary iron by the NAS (2001), and the NTP (2001a, 2001b) management status report and chemical repository summary were consulted for relevant information. The following computer searches, performed in April, 1993, were screened to identify additional pertinent studies not discussed in review documents: TOXLINE (oral and inhalation toxicity and cancer from 1983-April, 1993), CANCERLIT (1990 - April, 1993), MEDLINE (1991 - April, 1993), TSCATS, RTECS, and HSDB. Update literature searches were conducted in September, 2001 in TOXLINE (1992-September, 2001), CANCERLIT (1992- September, 2001), MEDLINE (1992-September, 2001), TSCATS, RTECS, DART/ETICBACK, EMIC/EMICBACK, HSDB, GENETOX, and CCRIS.

Iron is an essential element, and deriving a risk assessment value for such chemicals poses a special problem in that the dose adversity curve is "U-shaped." Thus, the risk value must be protective against deficiency as well as toxicity. The NAS (2001) has established guidelines for iron intake that take into account physiological differences during different life stages (the following values per kg use the specified reference body weights). For non-breast-fed infants aged 0-6 months, the NAS (2001) established a daily adequate intake (AI) for iron of 0.27 mg/day (0.04 mg/kg-day for infants 2-6 months old) based on the daily amount of iron secreted in human milk; breast-fed infants typically receive only 0.15 to 0.3 mg Fe/day. The NAS (2001) Recommended Dietary Allowances (RDAs) for children are as follows: 11 mg/day (1.2 mg/kg-day) for infants between the ages of 7 and 12 months, 7 mg/day (0.54 mg/kg-day) for children aged 1-3 years, 10 mg/day (0.45 mg/kg-day) for ages 4-8 years, 8 mg/day (0.2 mg/kg-day) for ages 9-13 years, and 11 mg/day (0.17 mg/kg-day) for boys and 15 mg/day (0.26 mg/kg-day) for girls aged 14-18 years. The RDA for men aged 19 years and above is 8 mg/day (0.11 mg/kg-day). The RDA for non-pregnant women is 18 mg/day (0.29 mg/kg-day) for ages between 19 and 50 years and 8 mg/day (0.13 mg/kg-day) for ages 51 years and older. The RDA for pregnant women is 27 mg/day (0.37 mg/kg-day for those aged 14-18 years and 0.35 mg/kg-day for those aged 19-50 years). The RDA during lactation is 10 mg/day (0.18 mg/kg-day) for women aged 14-18 years and 9 mg/day (0.15 mg/kg-day) for women aged 19-50 years.

In humans and other animals, levels in the body are regulated primarily through changes in the amount of iron absorbed by the gastrointestinal mucosa. The absorption of dietary iron is influenced by body stores, by the amount and chemical nature of iron in ingested food, and by a variety of dietary factors that increase or decrease the availability of iron for absorption. However, excessive accumulation of iron in the body resulting from chronic ingestion of high levels of iron cannot be prevented by intestinal regulation of absorption, nor do humans have a mechanism to increase excretion of absorbed iron in response to elevated

body levels (NAS, 1989, 2001). Below are summaries of selected epidemiological and medical studies, and of available toxicity studies in animals exposed to iron and inorganic compounds.

REVIEW OF PERTINENT LITERATURE

Human Studies

While chronic iron toxicity occurs in people with genetic metabolic disorders resulting in excessive iron absorption, with abnormal hemoglobin synthesis, or who receive frequent blood transfusions (Jacobs, 1977; Bothwell et al., 1979), there is a long-standing controversy as to whether a chronic overload due to oral intake is possible in individuals with a normal ability to control iron absorption (Hillman and Finch, 1985). Nevertheless, "the cumulative experience in human subjects suffering from iron overload of various etiologies strongly suggests that iron is noxious to tissues [when]...present in parenchymal cells...for a sufficiently long period of time" (Bothwell et al., 1979).

Looker et al. (1988) made comparisons of dietary iron intake and biochemical indices of iron status based on values taken from the second National Health and Nutrition Examination Survey (NHANES II) data base[3]. NHANES II was a probability sample of the noninstitutionalized U.S. population aged 6 months to 74 years, conducted between 1976 and 1980 by the National Center for Health Statistics. These data suggest that normal intake of iron by men 16-74 years old exceeds the RDAs, and that iron intake is somewhat lower than the RDA for women younger than 51 years. Concomitant with the study of dietary intake, the NHANES II measured the iron status of these populations. The serum ferritin levels, which index total body iron stores, ranged from 23.8 Fg/L, for premenopausal women not using iron supplements, to 105.6 Fg/L for 45- to 64-year-old supplement users. These values are well within the normal range of 12-300 Fg/L (Cook, 1991). (From Taber's Medical Dictionary, ferritin is the form in which iron is stored in the tissues, principally in the reticuloendothelial cells of the liver, spleen, and bone marrow. [It is] an iron-phosphorus-protein complex containing about 23% iron.) The percent serum transferrin saturation, a measure of the residual capacity of the iron transport system to process potential variations in iron from dietary intake or catabolized body stores, ranged from 23.9% saturation for pre- and post-menopausal women not using iron supplements, to 28.9% saturation for male supplement users in the 25- to 44- and 65- to 75-year-old groups. These values are also within the normal range (20-40%), establishing that the intake levels of 0.15-0.27 mg/kg-day consumed by these groups are both sufficient to protect against iron deficiency and insufficient to cause the toxic effects of iron overload (Elinder, 1986; Cook, 1991; Hillman and Finch, 1985). Therefore, 0.15-0.27 mg/kg-day represents a NOEL for chronic dietary iron intake.

Hemosiderosis (or siderosis) and iron overload are increases in tissue iron or a general increase in iron stores without associated tissue damage (Bothwell et al., 1979; Jacobs, 1977). Hemochromatosis describes massive iron overload (15 g of body iron stores or greater) together with cirrhosis and/or other tissue damage attributable to iron. Although focal deposits of iron may occur in any part of the body where red cells are extravasated, the clinical syndrome of hemochromatosis typically involves damage to the

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[3] The latest version of this data base, NHANES III (1984-1988) evaluated 30,000 subjects aged 2 months and above (NAS, 2001). Despite minor differences in the data sets, the conclusions drawn by Looker et al. (1988) based on NHANES II appear to be valid for the NHANES III data.

hepatic parenchyma (particularly fibrosis), heart (cardiac dysfunction including failure) and endocrine glands (particularly hypogonadism). Pancreatic iron deposition is common, and massive deposits may be associated with fibrosis and diabetes. A number of studies involving chronic oral administration of iron to animals have been designed in an attempt to identify an animal model for hemochromatosis. Most of these studies have been negative (Bothwell et al., 1979; NRC, 1979). Animal studies involving parenteral administration of iron have been generally negative as well, even though parenteral routes bypass the mechanisms that regulate absorption of iron from the gastrointestinal tract.

Chronic iron toxicity has been observed in people with idiopathic hemochromatosis (a genetic metabolic disorder resulting in excessive iron absorption), abnormalities of hemoglobin synthesis (e.g., thalassemia) or various anemic states (e.g., sideroblastic anemia), frequent blood transfusions or a combination of these conditions (Jacobs, 1977; Bothwell et al., 1979). Chronic hemochromatosis has also occurred among the South African Bantu population from an excessive intake of absorbable iron in an alcoholic beverage.

Habitual excessive intake of iron by the Bantus is attributed to consumption of home-brewed Kaffir beer, which was contaminated by iron vessels during brewing (Bothwell and Bradlow, 1960; Bothwell et al., 1964). The beer's high acidity (pH 3-3.5) enhanced iron leaching from the vessels. The iron in the beer is readily assimilable (i.e., ionizable) due to the acidity and presence of iron-complexing ligands such as fructose, and is absorbed to approximately the same degree as ferric chloride. The alcohol content of the beer is also believed to contribute to the bioavailability of the iron (Jacobs, 1977; Finch and Monsen, 1972). Based primarily on drinking habits and analyses of beer samples, the estimated average dietary iron intake of the Bantu men ranged from 50-100 mg/day from beer alone (Bothwell et al., 1964). Using a reference body weight of 70 kg (U.S. EPA, 1987), this range corresponds to 0.7-1.4 mg/kg-day. Histological examinations of the liver of 147 Bantus (129 male, 18 female), ranging in age from 11-70 years (most were between 20 and 50 years old) that died from acute traumatic causes, were performed (Bothwell and Bradlow, 1960). Varying degrees of hepatic siderosis were observed in 89% of the cases; the degree tended to increase with age 40-50 years or less. The siderosis was mild in 59%, and severe in 19% of the cases, respectively. There was a close correlation between hepatic iron concentration and portal fibrosis and cirrhosis. Although the overall prevalence was low (15.6% fibrosis and 1.4% cirrhosis), all 11 subjects with the highest iron concentrations (>2.0% dry weight of liver) showed either fibrosis or cirrhosis. Histological examination of the spleen (50 subjects) also showed siderosis and unspecified histological changes. Malnutrition and alcoholism could have played a role in the etiology of the hepatic and splenic siderosis in the Bantus.

Hemosiderosis of the skin and liver with cirrhotic changes, accompanied by a serum iron level of 246 Fg/100 mL and 100% saturation of transferrin, also developed in a 60-year-old female patient who ingested approximately 12,000 g of elemental iron (as 12 g ferrous carbonate/day or 2 g ferrous gluconate/day) for 27 years (Turnberg, 1965). Assuming a mean body weight of 64 kg for a woman 33-60 years old, 12 kg iron 365 days/year for 27 years averages to approximately 19 mg/kg-day. Using an estimated intake of 0.17 mg iron/kg-day for dietary iron, the total intake of iron was approximately 19.2 mg/kg-day. The author noted that the patient was not anemic during the treatment period, was absorbing iron at a normal rate, had no history of hepatitis (a potential complication in people with iron overload following repeated transfusion) and did not consume alcohol. It was concluded that the prolonged high iron intake was the sole origin of the clinical picture of hemochromatosis.

Ethiopia reportedly has the highest per capita iron intake in the world, with an average daily intake of 471 mg iron/day (range 98-1418 mg/day; 1.4-20.3 mg iron/kg-day assuming 70 kg body weight) (Roe, 1966; Hofvander, 1968). Increased stored iron in the liver and adverse health effects have not been observed due to low bioavailability of the iron in Ethiopian food.

A study in Eastern Finnish men suggested that high serum ferritin concentration and high dietary iron intake are risk factors for myocardial infarction (Salonen et al., 1992). Of the 1,931 randomly selected men aged 42-60 years who had no history of coronary heart disease upon entry to the study, 51 experienced an acute myocardial infarction during the average 3-year follow-up. After adjusting via Cox proportional hazards model for age and examination year, cigarette-pack years, ischemic ECG in exercise test, oxygen uptake, systolic blood pressure, blood glucose, serum copper, blood leukocyte count, and concentrations of serum high density lipoprotein cholesterol, apolipoprotein B, and triglyceride, those having serum ferritin at levels $ 200 Fg/L (median value for healthy adult men is 69-140 Fg/L) showed increased risk ($p<0.01$) of myocardial infarction compared to those with lower serum ferritin. Use of the same model and covariates indicated dietary iron intake was also significantly ($p<0.05$) associated with disease risk; consumption of red meat had the strongest correlation of all foods with serum ferritin concentration ($r=0.059$). High serum low density lipoprotein (LDL) cholesterol concentrations (≥ 5.0 mM/L) associated with elevated serum ferritin was also a strong risk factor for acute myocardial infarction; this lent support to the theory that iron overload elevates risk of acute myocardial infarction by promoting oxidation of LDL (Lauffer, 1991; Sullivan, 1992).

Although follow-up studies by the same laboratory and a prospective cohort study by a different investigator reported an association between high serum ferritin concentrations and increased risk of coronary heart disease or carotid vascular disease, respectively, five other large studies found no association between serum ferritin levels and coronary heart disease (NAS, 2001). Various other measures of iron status (serum transferrin saturation, serum iron concentration, and total iron-binding capacity) have been examined for a possible link to cardiovascular disease in prospective cohort studies, but results overall have been characterized as contradictory (Meyers, 1996; NAS, 2001). The NAS (2001) concluded that the available evidence "does not provide convincing support for a causal relationship" between the level of dietary iron intake and the risk for coronary heart disease, although iron cannot be definitively excluded as a risk factor.

The effects of acute oral exposure to iron in humans are well characterized. Acute iron toxicity has most often been observed in small children who accidentally ingested iron supplements, usually in the form of ferrous sulfate, but also as ferrous gluconate, ferrous chloride, ferric chloride or ferric ammonium citrate (Bothwell et al., 1979). The pathogenesis of acute oral iron toxicity consists primarily of gastrointestinal, cardiovascular, metabolic, neurological and hepatic alterations caused by direct corrosive action or the presence of unbound iron in the circulation (Bothwell et al., 1979; Banner and Tong, 1986; Engle et al., 1987; Mann et al., 1989). Gastrointestinal toxicity is due to the direct caustic effect of iron on the mucosa, particularly in the stomach and small intestine, and is characterized initially by vomiting, diarrhea and abdominal pain. These symptoms can progress to gastric and intestinal hemorrhage and/or necrosis and, rarely, 4-6 weeks after ingestion, scarring that may result in stenosis in the stomach outlet and small intestine. Cardiovascular toxicity of iron results from severe hemodynamic alterations characterized by loss of vascular integrity, decreased circulating plasma volume, decreased cardiac output and acidosis, leading to shock and cardiac failure. Neurological effects ranging from lethargy and mild obtundation to coma may occur. Hepatic damage, which can range from cloudy swelling of hepatocytes to necrosis, is a rare complication after ingestion of large quantities of iron in acute overexposure.

Determinations of serum iron concentration and total iron binding capacity (TIBC) in blood 2-4 hours after ingestion may provide reliable laboratory indices of the bioavailability of iron resulting from an acute ingestion (Mann et al., 1989), but are impractical for assessments of environmental exposures because they may be difficult to obtain rapidly. Since iron is rapidly cleared from the plasma and taken up by hepatocytes, samples drawn 4-6 hours after exposure may be low and not indicative of the quantity of iron bioaccumulated following ingestion. Clinically serious acute iron toxicity generally occurs when free unbound iron circulates (i.e., when serum iron exceeds the TIBC of transferrin and the serum transferrin is 100% saturated). Serum levels of iron are normally in the range of 65-165 Fg/100 mL; concentrations of 150-350 Fg/100 mL may be associated with mild symptoms, and concentrations >350 Fg/dL are generally considered toxic if the TIBC or the percent saturation of serum transferrin is not available (Engle et al., 1987; Mann et al., 1989). Except for the case reported by Turnberg (1965), in which a chronically exposed patient suffering iron overload had 246 Fg/100 mL iron in her serum with 100% saturation of her serum transferrin, data on serum levels of iron following repeated exposures were not located.

Information on acute oral toxic doses of iron in humans is available from numerous case reports of ingestions by children, but values vary because it is difficult to obtain accurate estimates of the amount taken in most overdose situations. It may be unclear whether amounts of elemental iron or iron compound are reported, and serum iron levels may peak at different times depending upon the type of product ingested (Engle et al., 1987). Reviews of these case reports indicate that doses in the range of 200-300 mg iron/kg are generally considered lethal (Arena, 1970; Krenzelok and Hoff, 1979; NRC, 1979; Engle et al., 1987; Mann et al., 1989; Klein-Schwartz et al., 1990), although doses as low as 40-60 mg iron/kg have been regarded as potentially fatal (NRC, 1979; Krenzelok and Hoff, 1979).

Minimum acute toxic doses of iron in humans are poorly defined because most of the cases of poisoning were overdose situations that relied on clinical histories (information from the patient or parent) for determination of dose. Additionally, toxicity mitigation procedures may complicate determining actual severity of effects. Management of acute iron poisoning typically includes gastrointestinal decontamination (e.g., emesis with syrup of ipecac, gastric lavage) and/or chelation therapy with deferoxamine performed at varying times after ingestion (Mann et al., 1989). Based on reviews of case reports and consensus opinions, treatment protocols generally consider ingestions of <20 mg iron/kg minimally toxic and ingestions of >40 mg iron/kg potentially serious (Engle et al., 1987; Mann et al., 1989; Elinder, 1986). Klein-Schwartz et al. (1990) analyzed 339 iron ingestion cases to validate the treatment protocol of a regional poison control center. According to the protocol of this center, ingestions of 20-40 mg iron/kg required only home treatment if there were no symptoms other than mild gastrointestinal symptoms, and ingestions 40 mg iron/kg or higher required hospital referral. The median age of the subjects was 3 years (range, 9 months to 33 years). The amount of iron ingestion was known in 199 subjects, ranging from 20-301 mg/kg (mean, 39.5 mg/kg). Of the 199 subjects, 144 ingested 20-40 mg/kg, 31 ingested 40-60 mg/kg, and 24 ingested 60 mg/kg and higher. There was no statistically significant difference in the mean dose ingested by patients with symptoms (abdominal pain, vomiting and/or diarrhea), compared with asymptomatic patients [42.2 mg/kg versus 38.5 mg/kg (p=0.33)]. The overall prevalence of the gastrointestinal symptoms was higher in the 40-60 mg/kg and 60 mg/kg or higher groups (41.9 and 33.3%, respectively), than in the 20-40 mg/kg group (22.2%), but the differences among the three groups were not statistically significant (p=0.058). Also, there was no statistically significant difference (p>0.05) in the development of any of the specific symptoms in any of the groups. The prevalence of symptoms generally increased with increasing serum iron levels, but only 20 of the patients had serum iron levels higher than the concentration of 350 Fg/dL, generally considered toxic. Symptoms more serious than gastrointestinal ones (e.g., metabolic, cardiovascular, central

nervous system or hepatic effects) did not develop in any of the patients. The results of this study suggest that acute iron ingestions in the range of 20-60 mg/kg are unlikely to be serious in children. Based on this study, the poison center protocol was changed to home management (i.e., ipecac syrup), for iron ingestions of 20-60 mg/kg unless significant symptoms developed, and hospital referral for ingestions 60 mg/kg or greater.

Effects of iron therapy on the upper gastrointestinal tract were evaluated in 14 healthy volunteers [13 women, 1 man; mean age 29 years (range, 24-48 years)] who were instructed to ingest 325 mg tablets of ferrous sulfate (65 mg iron) 3 times/day (before meals) for 2 weeks (Laine et al., 1988). This study was performed to ascertain whether there is a basis for implications that iron therapy may cause false-positive fecal occult blood testing. Evaluation consisted of gastrointestinal symptom survey, qualitative (Hemoccult) and quantitative (HemoQuant; mg mercury/g stool) testing for fecal blood loss, endoscopy of the upper gastrointestinal tract and histological examination of pinch biopsies of the gastric body, antrum and duodenum. In a separate portion of the study, Hemoccult testing was performed on 13 other subjects [12 men, 1 woman; mean age 33 years (range 23-50 years)] who were similarly treated with ferrous sulfate for 1 week. All subjects served as their own controls and ingested no other substances that could potentially damage the upper gastrointestinal tract during their participation in the study. Based on actual average ingestion of 2.5 tablets/day (2-week study) and 2.6 tablets/day (1-week study) and a reference human body weight of 70 kg (U.S. EPA, 1987), the estimated doses consumed by the subjects were 2.3 and 2.4 mg iron/kg-day, respectively, in addition to dietary iron. All subjects had significantly increased ($p<0.05$) dark brown-black stools and symptoms of nausea and vomiting during the treatment period, but not abdominal pain, compared to the 2 weeks prior to treatment. The stool samples of all 27 subjects were Hemoccult-negative prior to iron treatment. Only 1 of 27 stool samples was questionably trace positive after treatment. Hemoglobin levels in stool did not change significantly after iron treatment. Endoscopic examination showed a significant ($p=0.003$) increase in abnormalities in the stomach, but not duodenum, after therapy. These changes consisted of erythema, small areas of subepithelial hemorrhage and solitary antral erosions in nine, six and two subjects, respectively, and were considered only minimally abnormal. Linear regression analysis showed that there was a significant correlation between endoscopy scores and abdominal pain scores ($r=0.64$, $p=0.01$), but not with vomiting ($r=0.5$, $p=0.07$), diarrhea ($r=0.46$, $p=0.1$) or nausea ($r=0.4$, $p=0.16$). No treatment-related histological changes were observed and there was no correlation between the endoscopic and histologic findings, although the investigators noted that the correlation between endoscopic findings and histologic changes in small mucosal pinch biopsies is "notoriously" poor. Although it was speculated that the changes in the stomach could represent a mild form of iron poisoning, the investigators concluded that the treatment caused mild endoscopic abnormalities of uncertain clinical significance in the stomach. Evidence for iron overload (tissue biopsies or hematologic iron status indices) was not examined.

Adverse developmental effects in humans have not been associated with the ingestion of supplemental iron during pregnancy. As indicated above, NAS (2001) recommended that pregnant women supplement their diets with 27 mg iron/day (0.37 mg/kg-day). McElhatton et al. (1991) reported on 49 women who took an overdose of a simple iron preparation (53%) or iron with folate preparation (47%). For 48 of the women, the amount of iron ingested was known; 28 took > 1.2 g and the remainder took # 1.2 g. Twenty-five of the women received chelation treatment with desferrioxamine (DFO) and 12 received an emetic. Maternal toxicity, consisting of nausea, vomiting, hematoemesis, abdominal pain and diarrhea, was observed in 35 of the women. Two spontaneous abortions occurred and there were 3 premature deliveries. One of the spontaneous abortions and the premature deliveries were not related to the iron overdose. It is not known if the other spontaneous abortion occurring at 22 weeks (3 weeks after the overdose) was caused by the iron

overdose. A LOAEL for maternal toxicity or NOAEL for developmental toxicity could not be identified due to inexact exposure data, variation in type of mitigation used, and time elapsed prior to its administration.

Animal Studies

Repeated-dose oral studies in experimental animals found no significant effect of treatment with inorganic iron compounds. No treatment-related adverse changes in clinical signs, body or organ weights, food consumption, or histopathology were observed in male Sprague-Dawley rats that had daily dietary intakes of 35, 70, or 140 mg of iron (as $FeSO_4$ or FeEDTA) per kg for up to 61 days (Appel et al., 2001). In male and female F344 rats that were exposed to drinking water containing 0.25 or 0.5% ferric chloride ($FeCl_3 \cdot 6H_2O$) for 104 weeks, there were no dose-related effects other than reduced water intake (possibly affected by palatability) and body weight gain (Sato et al., 1992). In the latter study, the iron intakes were 58 or 110 mg/kg-day in males and 65 or 116 mg/kg-day in females.

No treatment-related teratogenic or embryotoxic effects were observed in rats given 2.7 mg iron/kg-day as ferric chloride on gestational days 6-15 (Nolen et al., 1972), or in rats and mice given 24-76 mg iron/kg-day as ferrous sulfate for 6 days during gestation (days unspecified) (Tadokoro et al., 1979). Some embryonic mortality (numbers and species not reported) occurred in the latter study at 240 mg iron/kg-day.

DERIVATION OF A PROVISIONAL RFD FOR IRON

Most of the quantitative chronic oral toxicity data for iron have been obtained from studies of the Bantu population of South Africa. These data indicate that intakes in the range of 0.7-1.4 mg iron/kg-day in home-brewed beer are associated with hemosiderosis and liver cirrhosis (Bothwell and Bradlow, 1960; Bothwell et al., 1964). However, confounding factors such as malnutrition and unusually high iron bioavailability, due to the high acidity and ethanol in the beer, preclude use of these data for risk assessment. Much higher dietary intakes (average 6.7 mg/kg-day) of less soluble forms of iron are tolerated in nonwestern diets as indicated by studies of populations in Ethiopia. Therapeutic oral doses of 2.3 mg iron/kg-day as ferrous sulfate for 2 weeks were minimally toxic to the gastrointestinal tract, causing nausea, vomiting and endoscopic abnormalities in the stomach (e.g., erythema and small areas of hemorrhage), but no gastric histological changes were found, and evidence for iron overload (tissue biopsies or hematologic iron status indices) was not examined (Laine et al., 1988). One case of hemochromatosis was reported in a woman who ingested 19.2 mg/kg-day of iron for 27 years; treatment was not accompanied by alcohol- or transfusion-induced hepatitis, anemia, malnutrition or abnormal intestinal absorption (Turnberg, 1965). Thus, although toxicity associated with iron overload due to chronic oral intake can be demonstrated qualitatively or even semiquantitatively, assignment of a precise LOAEL for normal individuals consuming western diets is compromised by studies containing confounding factors, inadequate endpoint assessment, too short a duration of exposure or too few subjects.

Nonetheless, it is possible to establish a NOEL for chronic iron overload using the values for dietary intake and iron status indices taken from the second National Health and Nutrition Examination Survey (NHANES II) data base. Looker et al. (1988) made comparisons of dietary iron intake and biochemical indices of iron status using data from NHANES II. The average intakes of iron ranged from 0.15 to 0.27 mg/kg-day. The serum ferritin levels and percent serum transferrin saturation were within the normal range. Thus, intake levels of 0.15-0.27 mg/kg-day are both sufficient to protect against iron deficiency and insufficient to cause the toxic effects of iron overload.

Using the NOAEL of 0.27 (representing the upper bound value in the range of mean dietary iron intakes, dietary plus supplemental, taken from the NHANES II data base) and dividing by an uncertainty factor of 1 yields the provisional chronic oral RfD of 0.3 mg/kg-day. An uncertainty factor of 1 is supported by the fact that iron is an essential element.

The provisional chronic RfD is calculated as follows:

$$RfD = NOAEL_{ADJ} / (UF \times MF)$$

where

NOAEL = 0.27 mg/kg-day (representing the upper bound value in the range of mean dietary iron intakes, dietary plus supplemental, taken from the NHANES II data base)

UF = uncertainty factor = 1 (supported by the fact that iron is an essential element)
MF = modifying factor = 1 (standard default)

thus,

RfD = [0.27 mg/kg-day]/[1] = 0.27 = 0.3 mg/kg-day

In addition, the information used to derive the oral RfD for iron was derived from intake data from over 20,000 individuals aged 6 months to 74 years. Furthermore, humans exert an efficient homeostatic control over iron such that body burdens are kept constant with variations in diet.

NOTE: This RfD supplies adequate levels of iron to meet the nutritional requirements of adults and adolescents over a lifetime. It does not supply the recommended dietary allowance (RDA) to those members of the population that have greater requirements for a short, less-than-lifetime duration such as infants (7-12 months) and pre-adolescent children (1-8 years), and pregnant women. For shorter term requirements for these subpopulations, refer to the RDAs (NAS, 2001). In addition, the RfD exceeds the AI for infants 6 months or younger (NAS, 2001). Furthermore, this RfD may not be protective of people with inherited disorders of iron metabolism and could be conservative if applied to exposure scenarios involving forms of iron with low bioavailability.

STATEMENT OF CONFIDENCE

Confidence in the critical study is high; the NHANES II data were derived from a very large sampling of the U.S. population ranging in age from 6 months to 74 years and are consistent with the findings in the subsequent NHANES III data set (NAS, 2001). Overall confidence in the data base is medium; there are sufficient data to determine what chronic dose level is associated with adverse effects in healthy individuals. While a point estimate has been derived in this risk assessment, individual variations in diet, nutritional status, physiology, etc. suggest that a range of values may be more appropriate. Reflecting the high confidence in the critical study and medium confidence in the data base, confidence in the RfD is medium.

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Michael,

We don't have any toxicity information for Vanadium. However, we do have surrogates for some of the PAHs that you requested. Here are the suggested surrogates:

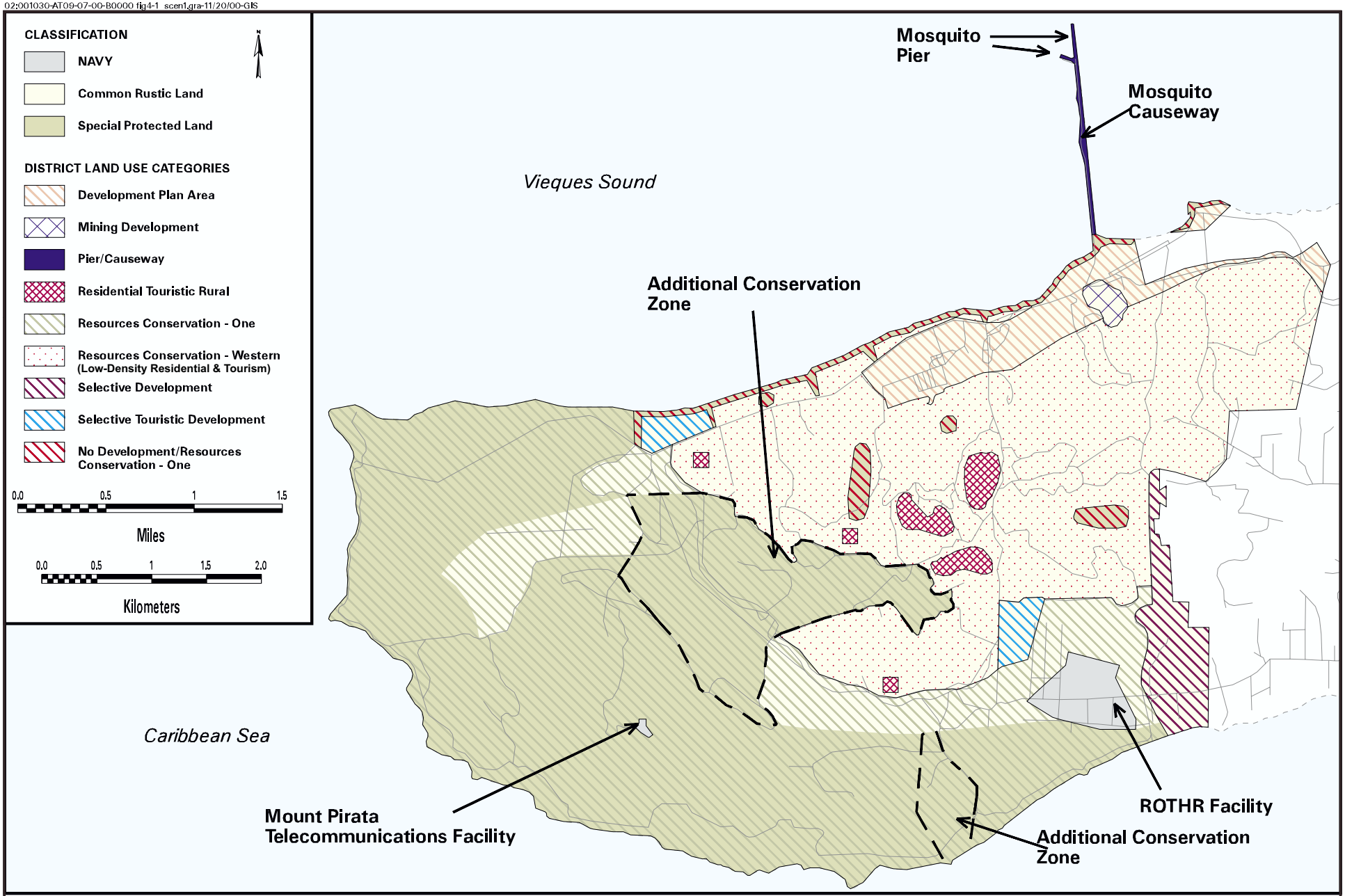
Chemical		Surrogate
Benzo[a]anthracene		Pyrene (Fluoranthene or Naphthalene)*
Benzo[a]pyrene	None	
Benzo[b]fluoranthene		Pyrene (Fluoranthene or Naphthalene)*
Benzo[k]fluoranthene		Pyrene (Fluoranthene or Naphthalene)*
Dibenz[ah]anthracene		Pyrene (Fluoranthene or Naphthalene)*
Indeno[1,2,3-cd]pyrene		Bisphenol A

*Pyrene is the primary suggested surrogate and Fluoranthene or Naphthalene are suggested secondary surrogates.

Please feel free to contact us if you have any other questions.

Thank you,
Ann Parker
STSC

02:001030-AT09-07-00-B0000 fig4-1 scen1.gra-11/20/00-GIS



Source: PRPB 2000, US Navy 2000

FIGURE L-1
Proposed Land Use and Zoning Classifications by Puerto Rico Planning Board
SWMU 6, Former NASD, Vieques Island, Puerto Rico

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ES022007003TPA

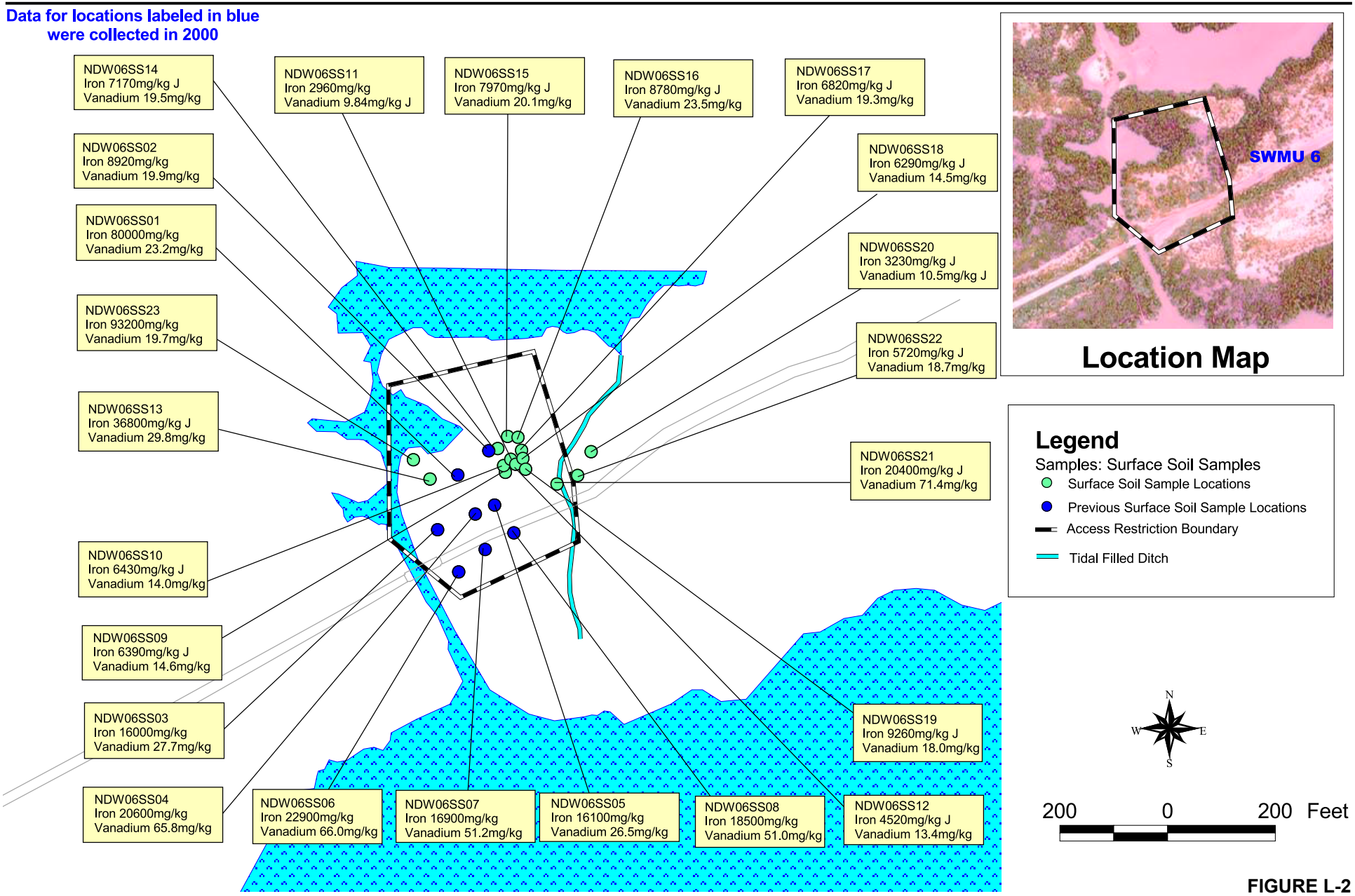
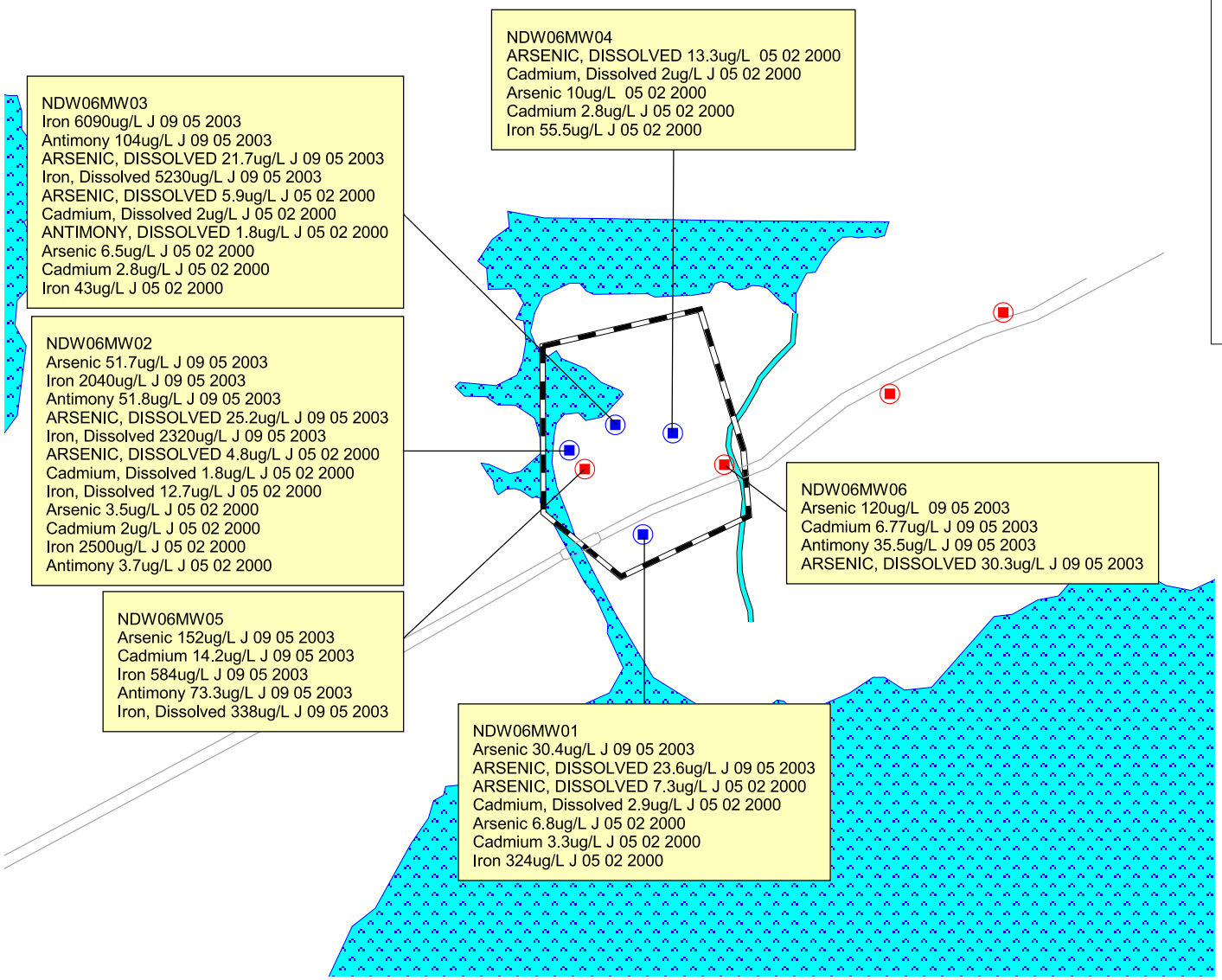


FIGURE L-2

Iron and Vanadium Concentrrations Detected in Surface Soil

SWMU 6, Former NASD, Vieques, Puerto Rico

Data for locations labeled in blue were collected in 2000



Location Map

Legend

Samples:Ground Water Samples

- Monitoring Well Locations
- Previously Installed Monitoring Wells
- Access Restriction Boundary
- Tidal Filled Ditch

N
W E
S

200 0 200 Feet

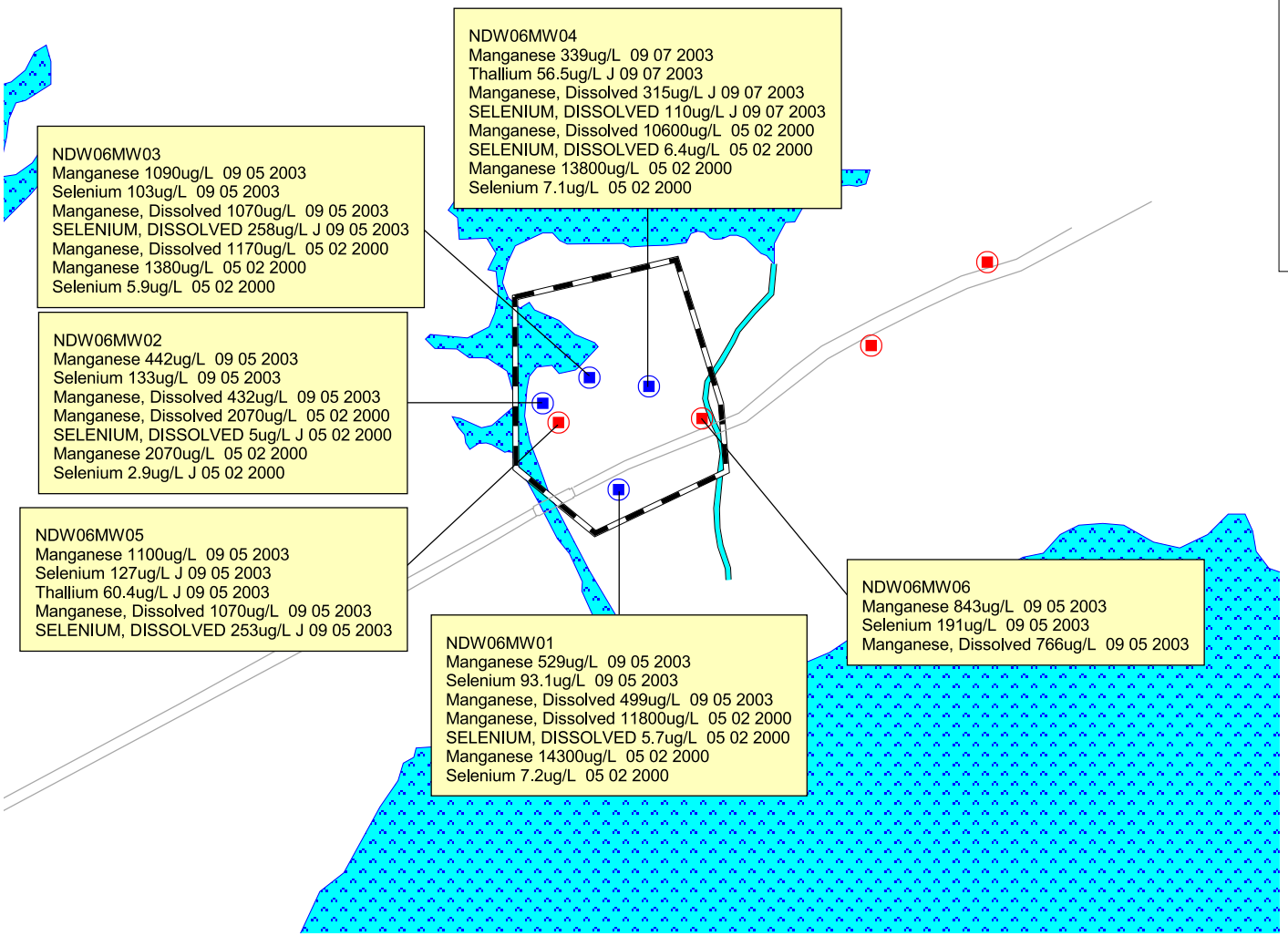
FIGURE L-3

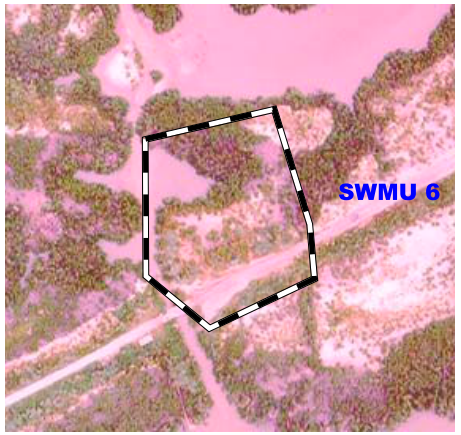
Antimony, Arsenic, Cadmium and Iron Detected in Groundwater

SWMU 6, Former NASD, Vieques, Puerto Rico

CH2MHILL

Data for locations labeled in blue were collected in 2000





Location Map

Legend

Samples:Ground Water Samples

- Monitoring Well Locations
- Previously Installed Monitoring Wells
- Access Restriction Boundary
- Tidal Filled Ditch

N W E S

200 0 200 Feet

FIGURE L-4

Manganese, Selenium and Thallium Detected in Groundwater

SWMU 6, Former NASD, Vieques, Puerto Rico

CH2MHILL

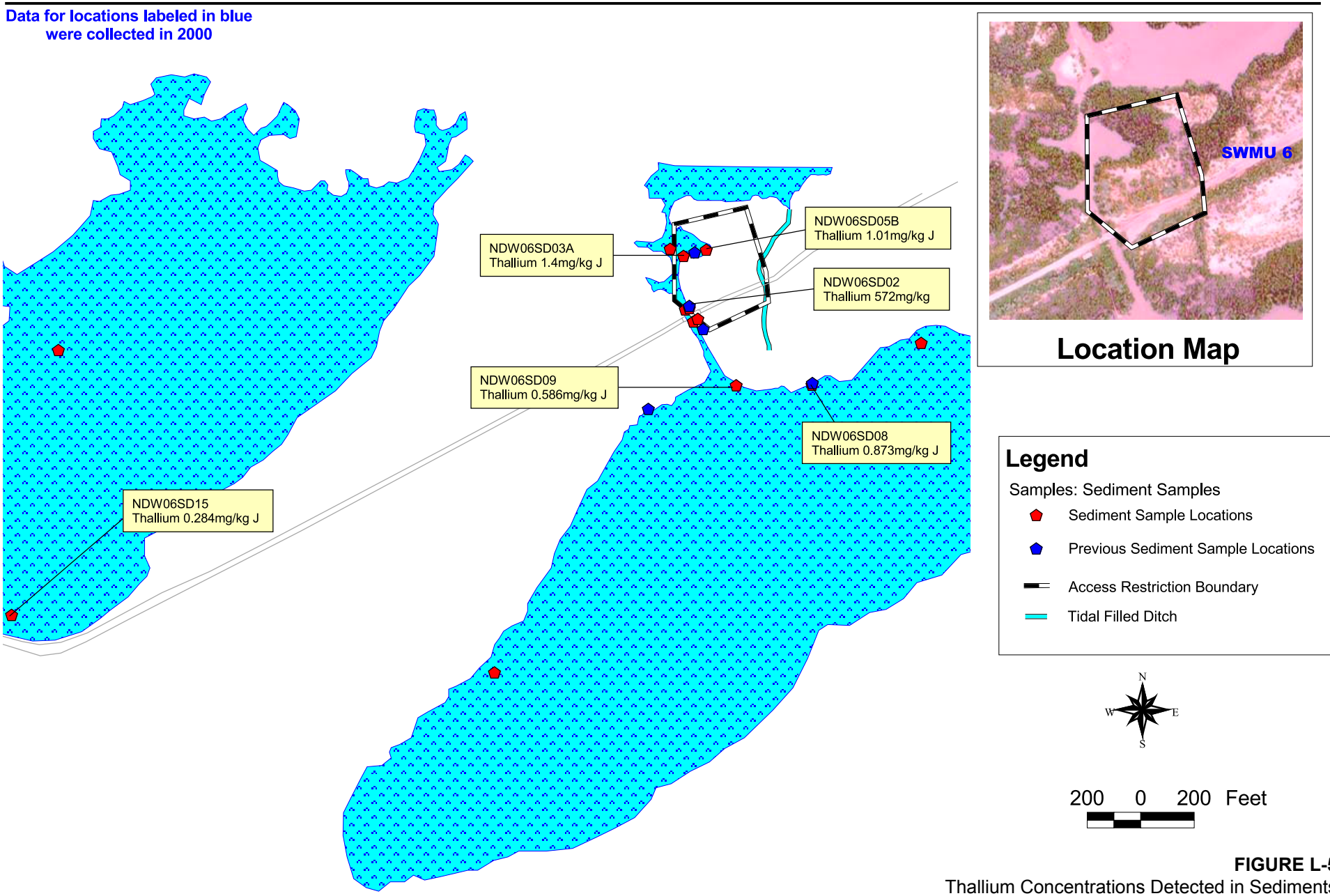


FIGURE L-5
Thallium Concentrations Detected in Sediments
SWMU 6, Former NASD, Vieques, Puerto Rico

Introduction to Appendix M

This appendix presents the regulatory agency comments provided on the *Draft Remedial Investigation Report, Solid Waste Management Unit (SWMU) 6, Former Naval Ammunition Support Detachment, Vieques Island, Puerto Rico* (CH2M HILL, April 2004). Since submission of the draft report in 2004, the Navy and regulatory agencies have concurred that a removal action will be conducted at this site. Therefore, the agencies agree that rather than address individual agency comments, the substantial comment themes (e.g., uncertainties associated with sample locations, conclusions regarding potential risk, etc.) are acknowledged by text insertions (and some text deletions) throughout the text of the report to show that the findings/conclusions drawn by the Navy in the draft report are not necessarily concurred upon by the regulatory agencies, but that the uncertainties associated with the waste piles being a potential future source of contamination will be addressed by the removal action. In other words, questions and/or comments raised by the regulatory agencies on the findings and conclusions of this report will be appropriately addressed by the removal action and its associated confirmatory sampling and evaluation protocol, which will be documented in a closeout report.

EPA Comments
Draft Remedial Investigation Report
Solid Waste Management Unit (SWMU) 6
Former Naval Ammunitions Support Detachment
Vieques Island, Puerto Rico
April 2004

GENERAL COMMENTS:

1. The work plan for this site was enacted without resolving comments on the plan. The last version of the work plan is dated February 2003. There were extensive comments on this document and there does not appear to have been a resubmittal of the work plan with comments addressed. This presents a difficulty in reviewing the RI report in that there was no agreed upon plan to reference against what was actually done at the site. One of the key issues which was never formally resolved was EPA=s request to sample under the debris piles. The Navy objected to this request and stated that it had collected additional information on the site through field reconnaissance. This additional information was requested, however, never presented to the EPA.

   From the drill logs and cross sections presented in the report, it appears that the site is best characterized as a case of surface dumping rather than as landfilling. This being the case, it is fully appropriate to collect samples from under areas where debris has been dumped. Samples collected where no debris was dumped are less likely to identify any contamination which is present.

   Surface samples collected during the RI were apparently in areas near material that was dumped, but not in actual potential source areas. As a result, it is not possible to determine if the site is actually impacted. Samples from beneath debris should be collected prior to making decisions about the site.

2. Subsurface soil samples were included in the draft work plan, but were not collected. The reason given is that groundwater was encountered at shallow depths of roughly 1 ft bgs. This is not acceptable. First of all, it was known previous to the sampling effort that the water table would be quite shallow. In the PA/SI, a few subsurface samples were collected and they should have been included here as well. Second, making a determination based only on surface samples is not an acceptable approach. With disposal having occurred years in the past, soils at the surface may have had contaminants leached from them, while contaminates persist at greater depth. Third, it is not acceptable for the Navy to eliminate part of the sampling program without agreement from the regulating agencies. The subsurface soil samples need to be collected prior to making decisions about the site.

SPECIFIC COMMENTS

3. **Executive Summary, Contaminant Fate and Transport Summary, page ES-3:** The second to last paragraph states that detections of chloroform, PCBs, and perchlorate may not be site related. These chemicals are anthropogenic and thus must be related to some release or human activity. If there is a plausible explanation for their presence aside from the dumping at SWMU-6, then that information needs to be provided. Otherwise, it should not be claimed that the contaminants may not be site related. Reading the rest of the report, it appears that the Navy wishes to make the case that the detections are suspect, rather than unrelated to the site.

4. **Section 2.3.5.2, Groundwater, page 2-4:** The text references Figure 2-7 as showing water levels 4 hours before low tide, while the figure indicates that it is at high tide. Figure 2-8, showing low tide groundwater elevations should also be referenced in this section. Please clarify and amend.

5. **Section 2.6.2, Expanded PA/SI, page 2-6:** Include discussion of all detections of anthropogenic compounds, not just those above PRGs.

6. **Section 3.3, Groundwater Monitoring Well Installation, Development, and Sampling, page 3-3:** Please indicate how the IDW was disposed of rather than simply stating that it was handled according to management plan. If it was tested prior to disposal, present the testing results.

7. **Section 3.4.1, Monitoring Well Sampling and Analysis, page 3-5:** The text indicates that sampling for VOCs was conducted with a bladder pump and that all other parameters were sampled for using a peristaltic pump. This appears to be problematic. It is presumed that the well was purged using low flow methods with the bladder pump. Then, after collecting VOC samples, the pump was pulled from the well and the peristaltic pump was used to collect water for the other parameters. Low flow purging does not remove standing water from the well casing, but draws water from a small area proximal to the pump intake. Removing the bladder pump would have agitated water in the well, mixing the standing water in the well and perhaps increasing turbidity. Samples collected without further purging would therefore not be representative of the groundwater. If this was done, the sample results are not valid. Please give a detailed account of the method so that a determination can be made as to whether the results can be used.

   In addition, the text states that a minimum of three well volumes was purged. This is not the case. Please correct the text.

8. **Section 3.5.1, Surface Water Sampling, page 3-6:** Surface water (and sediment) sample locations are stated to be off by up to 1,000 feet as a result of the difficulty in returning to previous locations. While this may be reasonable, or at least acceptable for locations that were off by a small distance, it is neither for those that were 400 and 1,000 feet off. Mis-

locating a point by this much in this area is simply incompetence and does not fulfill the data need. The samples need to be recollected in the correct locations.

9. **Section 3.5.1, Surface Water Sampling, page 3-6:** The text indicated that filters were flushed with water prior to use. Please clarify if this was water from the sampling location or from another source. Flushing with DI water or water from any other than the sampling location could introduce inaccuracy into the results.

10. **Section 3.5.2, Sediment Sampling and Analysis, page 3-7:** Rather than stating that sediment samples were collected with either a hand auger or a ponar device, please state what equipment was actually used. Also, it is noted in the sediment section that a Whale pump was used to collect surface water samples. This is not an acceptable environmental sampling pump and the results are therefore suspect.

11. **Figure 3-3, Redial Investigation Monitoring Well Location Map:** In comments on the work plan, EPA had requested that a well be installed to the west of SB-03. The figure shows that instead, the well was placed north of the soil boring. At this location, it is not useful for providing information on flow from the site to the west, and thus does not provide the information which was being sought. Nonetheless, the overall groundwater sampling locations are sufficient for determining possible impacts. In the future, however, the desire to relocate a well should prompt a call with the agencies so that all can parties agree on the change.

12. **Section 4.1.4.1, Laboratory and Field Sampling Blank Contamination, page 4-4:** The text states that the perchlorate detection may be a false positive. It also appears that this conclusion is from one detection and one non-detect, although in fact there have been three (3) samples from this well. Please note that the well has been sampled three times, supporting the case that the single detection may have been anomalous.

13. **Section 4.1.5, Regulatory, Health-Based, and Ecological Screening Levels, pages 4-7 and 4-8:** The text identifies soil criteria from the Netherlands. These are clearly not applicable. In the past, EPA has requested that the Navy alert the agencies if new criteria are to be offered for consideration. This needs to be done before a document is received.

14. **Section 4.2.2.1, Surface Soil, Semivolatile Organic Compounds, page 4-12:** Please identify the two SVOCs for which PRGs were not available. It is possible that a surrogate chemical can be identified for screening and evaluation purposes.

15. **Section 4.2.2.1, Surface Soil, Volatile Organic Compounds, page 4-13:** The text notes that seven VOCs were detected. Please indicate what VOCs were detected, as well as including their concentrations on the Section 4 summary tables and figures. Referencing the full data tables in the appendix is not sufficient. Similarly, indicate which sample contained Aroclor-1254 and the concentration at which it was detected. This same comment applies to other portions of the sampling effort discussed in Section 4. All detections of anthropogenic compounds should be included in the summary tables and figures, as well as noted in the text.

16. **Sections 4.2.2.3, Groundwater, and Section 4.2.2.4, Surface Water:** According to Section 3 of the report, groundwater and surface water were also sampled for alkalinity and anions. These results need to be presented and interpreted. For instance, if the data supports the conclusion that groundwater is significantly saline or similar to sea water, that would have implications as to whether it should be considered as a potential drinking water source.

17. **Section 4.2.2.3, Groundwater, Inorganic Analytes, page 4-15:** The levels of metals in groundwater warrant further discussion. Concentrations of arsenic, for example, are significantly elevated in a number of wells. Concentrations in total and dissolved fractions show marked differences, although the sampling data sheets indicate that there was quite low turbidity in the samples. Some attempts to explain or understand the results are needed. As discussed in a previous comment, the sampling method may explain the inconsistent results. The removal of the bladder pump prior to sampling for metals may have resulted in increased turbidity that was not recorded in purging log. The results here need to be interpreted.

18. **Section 4.2.2.3, Groundwater, Polychlorinated Biphenyls, page 4-16:** There were detections of PCBs in a single well, but it was not repeated in the second sampling round. To provide more definitive evidence as to their possible presence in the groundwater, a third sample should be taken.

19. **Section 4.2.2.5, Sediment, Inorganic Analytes, page 4-19:** Sample SD02 had elevated concentrations of a number of metals. It appears that more recent samples, such as SD12 and SD13 were targeted in the same area in attempts to check the results from this sample. This should be discussed in the text and the local area shown on a larger scale figure that better shows the layout of the samples (page 5-12, has a single sentence that indicates that the more recent samples were a Are-sampling@ of the location, but more detail is needed).

20. **Section 4 Tables:** a) A DAF of 10 has been used for SSL values. The SSL guidance (and Region 9 PRG tables) provides for the adoption of default DAF values of 20 or 1, depending on site conditions. Other values need to be justified using site specific information. In the present case, the guidance indicates that a DAF of 1 should be selected, as the water table is very shallow. b) These tables (and associated figures) should include all detections of anthropogenic compounds, not just those above criteria and background.

21. **Section 5.2, Conceptual Site Model, page 5-2:** Salinity of groundwater is noted to be similar to that of seawater in a portion of SWMU-6. Presumably this implies that this is not the case in all the wells. Please present the data and show the distribution of saline versus fresh water across the site.

22. **Section 5.5, Contaminant Migration, page 5-12:** In the first sentence of the second paragraph, the term Aprincipal threat waste@ is used. Please define this term.

23. **Table 5-1, Summary of Field Sampling Data for Groundwater, 2003, page 5-15:** The

table should include pH.

24. **Section 6.5.1, COPC Selection for Human Health Risk Assessment, Bullet 2, page 6-5:** It is not reasonable to assume that a resident child or adult would have exposure to contamination at depths greater than 2 feet under typical scenarios. Therefore, it is not necessary to evaluate the residential populations to soils at this depth.

Construction activities would result in exposure to both surface and subsurface soils. Please evaluate exposure to this population using a dataset that contains soils from all depths.

25. **Section 6.5.1, COPC Selection for Human Health Risk Assessment, page 6-6:** The criteria for retaining chemicals for quantitative risk assessment are included in the first paragraph. EPA Region 2 also recommends retaining all Group A carcinogens, regardless of frequency of detection or comparison with a risk-based concentration. The rationale for this would be ATOX@ in the RAGS D Table 2 series.

26. **Section 6.5.1, COPC Selection for Human Health Risk Assessment, page 6-6:** In the fourth paragraph, the detections of chloroform, PCBs, and perchlorate are discussed. The language used in this paragraph should be revised to state in an objective way what the results indicate. Chloroform is cited as a common laboratory contaminant. However, if the result was not qualified as such during QA/QC review, then this language should be removed. PCBs were reanalyzed and the results of the confirmatory analysis did not repeat the original results. Therefore, no conclusions should be drawn regarding the presence of PCBs. The same rationale is used for perchlorate, and this is also not correct. In addition, the language that states that the analytical method for perchlorate often results in false positives should be referenced or removed. The Navy should also consider looking into other analytical methods for perchlorate that would not result in such a high likelihood of false positives.

27. **Section 6.6.1.4, Recreational Receptors, page 6-9:** Please explain why recreational swimming with full body dermal contact with water is not evaluated in the HHRA.

28. **Section 6.6.1.4, Recreational Receptors, page 6-9:** Please define the age of the youth trespasser.

29. **Sections 6.6.1, Potentially Exposed Population, and 6.6.2, Exposure Route Factors:** Please revise these sections so that the exposure parameters and pathways are comprehensively discussed in only one section.

30. **Section 6.6.2.3, Sediment Ingestion, page 6-10:** Please provide the rationale for selecting 2 of the soil ingestion rate as the sediment ingestion rate.

31. **Section 6.6.2.4, Surface Water Ingestion, page 6-10:** Please revise the second sentence to read, AThe ingestion intake of surface water....@

32. **Section 6.6.2.5, Surface and Subsurface Soil Dermal Contact, page 6-10:** Please revise this section to include a more comprehensive description of the population specific soil to skin adherence factors, and how these values were selected. It is unclear how some of these values were selected for use in the human health risk assessment.

33. **Section 6.6.2.9, Surface and Subsurface Soil Inhalation, page 6-11:** The PEF value used is the default value. Please calculate and use a site-specific PEF value that more closely represents the size of the site and the physical characteristics of the site. Also, please clarify if one PEF will be used for both surface soils and subsurface soils (for construction activities).

34. **Section 6.6.3.2, Exposure Point Concentration, page 6-11:** Please note that the latest version of the ProUCL tool is version 3.00.02 and is available at: http://www.epa.gov/nerlesd1/tsc/form.htm

35. **Section 6.7, Toxicity Assessment, page 6-13:** Please provide a more comprehensive discussion on the use of the TEF approach to evaluate PAHs. A table which lists the PAH TEF values, and a discussion of the EPA reference for this approach should be included.

36. **Section 6.7, Toxicity Assessment, page 6-13:** A list of chemicals for which toxicity values are not available from the IRIS database was sent to EPA ORD/NCEA for review. The following chemicals now have updated recommendations:

    a. Aluminum: The NCEA provisional value has been withdrawn pending further review; please address this chemical qualitatively.

    b. Iron: The NCEA provisional value has been withdrawn pending further review; please address this chemical qualitatively.

    c. Perchlorate: Please use the RfD of 0.0007 mg/kg-day, as recommended by the National Academy of Sciences review.

    d. Vanadium: Please use the chronic RfD recommended in the 1997 HEAST document.

    e. Mercury: Please use the RfC of 0.09 ug/m^3 developed by CalEPA.

    f. Nickel: Please use the RfC of 0.09 ug/m^3 as recommended by ATSDR.

    g. Carcinogenic PAHs: Please note that these chemicals are currently being evaluated by EPA ORD/NCEA for structural analysis to determine if any surrogate chemical can be used to identify an RfD value. The results will be forwarded when the evaluation is complete.

    h. PCBs: Please note that these chemicals are currently being evaluated by EPA ORD/NCEA for structural analysis to determine if any surrogate chemical can be used to identify an RfD value. The results will be forwarded when the evaluation is complete.

37. **Section 6.8, Risk Characterization, page 6-14:** In the last paragraph of this page, there is a discussion of COPCs in land crab tissue and fiddler crab tissue. First, this exposure pathway (ingestion of crab) should be included in the RAGS D Table 1 as an exposure pathway. Second, it appears as though the process used to evaluate these tissue concentrations was to compare these crab values to risk-based values for fish tissue ingestion. If this is correct, please include these comparisons in a RAGS Part D Table 2 for tissue ingestion. If not chemicals are flagged for further evaluation, this assessment would then be complete.

38. **Section 6.9.1, COPC Selection, page 6-16:** The last sentences of this section suggest that **certain COPCs do not have SSLs, but are not of concern because they are either within** background concentrations or do not present a threat for migration to groundwater. First, it is premature to discount these COPCs on the basis of a background comparison. Second, the chemicals which lack SSL values and are thought to not be of concern for groundwater migration should be identified by name.

39. **Section 6.9.2, Exposure Assessment, page 6-17:** Please revise this section to more accurately reflect the intent of the exposure assessment, which is to evaluate the maximum exposure reasonably anticipated to occur at a site. The use of groundwater as a potable water supply is being evaluated as a future use scenario only; this is driven by the ARAR that requires groundwater to be classified as a potable water supply. When evaluating potential exposure scenarios, land use scenarios may take into account a variety of factors, many of which are outlined in the OSWER Directive ALand Use in the CERCLA Remedy Process@. However, groundwater use is clearly not covered by this guidance, and is evaluated as stated in Section 300.430 (a)(1)(iii)(F) of the National Contingency Plan, which requires EPA to evaluate and return groundwaters to their beneficial use. Issues such as technical impracticability, likelihood of occurrence or productivity of the aquifer are addressed in the conclusions of the RI and in the FS.

40. **Section 6.10.1.1, Iron, page 6-18:** EPA recognizes that iron is naturally occurring in the soils on Vieques. However, the range of iron concentrations in the soil - 2960 mg/kg to 93200 mg/kg with a mean of 18500 mg/kg - indicates certain Ahot spots@ of iron contamination. Considering SWMU 6 was a nuisance dump site, it is possible that some of these areas may require additional investigation and/or remediation. Please consider the appropriateness of identifying these iron hot spot areas and evaluating them separately in the risk assessment.

41. **Tables 6-1, 6-2, 6-3, and 6-4, pages 6-23 to 6-26:** The repeated detections of Thallium at estimated concentrations suggests that a more sensitive analytical method should be considered. A more sensitive method would likely reduce the chance of false positives being reported.

42. **Figure 6-1, Proposed Land Use and Zoning Classifications by Puerto Rico Planning Board:** Please include the location of SWMU 6 on the figure.

43. **Section 7.2.1.1, Environmental Setting, page 7-5:** The on-site vegetation is noted as having similar species composition and structure to the reference location. However, no data are provided to support this statement. It is unclear whether the 25 percent cover noted for the red mangrove and black mangrove community (page 7-4) is typical of an unimpacted area. Similarly, the discussion regarding fauna and the statement that "there was no visible evidence" of an impact on the wildlife (page 7-5) should be supported. More detail regarding the aquatic receptors present in the lagoon, canal, and intermittent stream should be provided.

44. **Section 7.2.1.3, Preliminary Conceptual Model, Receptors, page 7-8:** It is recommended that a mammalian and avian herbivore and a mammalian insectivore be included for the exposure modeling. The potential for species such as shrews, herbivorous small mammals, and herbivorous (seed, berry, or grain eating) birds to be present at the site should be considered. Further, the use of the Norway rat and Indian mongoose are not recommended as receptor species. During the SLERA it is recommended that the diets modeled reflect the maximum ingestion of the most contaminated food source. Modeling to an omnivore would minimize potential exposure. Depending on the contaminant, a more limited diet may result in higher risk estimates, depending upon the bioaccumulation factors of contaminants in various dietary items. The American Robin is often used in ecological risk assessment as an avian insectivore; it is recommended that this organism be used in place of the pearly-eyed thrasher which is an omnivore. If the pearly-eyed thrasher is used, their diet should be considered to consist entirely of soil invertebrate.

45. **Section 7.2.1.3, Preliminary Conceptual Model, Receptors, page 7-9:** It is noted that SWMU 6 lacks significant habitat for amphibians and reptiles. However, mangrove communities often provide habitat for these organisms. Further, Table 7-2 *Wildlife Observed at SWMU 6* notes the presence of lizards (A*nolis sp.).*

46. **Section 7.2.2.1, Exposure Estimation, page 7-10:** All contaminants in exceedances of ecological screening values should be included in the food web models.

47. **Section 7.2.2.1, Exposure Estimation, Soil Invertebrates, page 7-11:** Although soil ingestion may be accounted for separately in the food web model, for the screening level ecological risk assessment (SLERA) it is recommended that undepurated values be used in assessing risk to insectivores/omnivores.

48. **Section 7.2.2.1, Exposure Estimation, Fish, page 7-12:** In addition to sediment exposure, the measurement endpoint should include comparing maximum surface water concentrations multiplied by a bioacummulation factor (BAF) to a threshold reference value.

49. **Section 7.2.4.1, Selection of Chemicals of Potential Concerns (COPCs), Food Web Exposures, page 7-15:** Dose model calculations should be provided and be transparent, so it is easily understood how doses were determined. For example, a table which provides maximum soil, sediment, and surface water concentrations used in the calculations should be provided.

50. **Section 7.2.4.1, Selection of Chemicals of Potential Concern (COPCs), Food Web Exposures, page 7-15:** It is indicated that, "Three pesticides and six PCBs were retained as COPCs because the maximum reporting limits exceeded screening values." This text is confusing, since food web exposures are estimated by comparing an ingested dose to NOAELs and LOAELs, rather than using screening values directly. It appears that the maximum reporting limits for detections below quantification limits were used as the input into the food chain models, and compounds with resulting HQs greater than 1.0 (i.e., dose estimates were greater than TRVs) were retained as COPCs. The text should be clarified or corrected to better reflect this. Additionally, it should also be noted that hexachlorobenzene was also retained for the same reason.

51. **Section 7.2.5, Screening Risk Conclusions, page 7-16, and Table 7-15, Summary of COPCs – Step 2, page 7-66:** It is indicated on page 7-16 that a summary of COPCs identified in soil, sediment and surface water are identified in Table 7-15. However, this table only provides information on food web model COPCs. Tables 7-11 through 7-13 provide information regarding COPCs in all three media, which is discussed in Section 7.2.4.1, Selection of Chemicals of Potential Concern Surface Soil, Surface Water, and Sediment (page 7-15) and should be summarized in Table 7-15, or in another table. The compounds 4-bromophenyl-phenylether, 4-chlorophenyl-phenylether, hexachlorocyclopentadiene , hexachloroethane, and 1,1,2,2-tetrachloroethylene should not be indicated in this table as being retained, since undetected chemicals without screening values were not identified as COPCs (see last paragraph on P. 7-15). Correction is needed.

52. **Section 7.3.2.3, Sediment, page 7-18:** The ERA states that literature screening values could not be found for the several detected VOCs. However, screening values for acetone, carbon disulfide, ethyl benzene, methylene chloride, and toluene may be found in Jones et al. (1997). Using the Jones et al. (1997) screening value for acetone (0.0087 mg/kg) and carbon disulfide (0.00085 mg/kg), calculated HQs would be 69 and 16 (acetone) and 26 and 11.4 (carbon disulfide), using the maximum and average concentrations, respectively. Therefore, these contaminants may be carried forward because contaminant concentrations exceed screening values, rather than because they do not have screening values.

53. **Section 7.3.3.1, Surface Soil Exposure, pages 7-19 and 7-20, and Table 7-24, Comparison of PCOC Surface Soil Concentrations to Background Concentrations, page 7-83:** There is no information provided in this table on aluminum background or on-site concentrations; therefore discussions comparing on-site data to background cannot be verified. In the discussion of iron concentrations, it would be helpful to indicate the frequency of exceedances of on-site iron concentrations in comparison to average background values, rather than simply background upper tolerance limits. Other inorganics are removed from further consideration because the screening value is protective of plants (zinc and lead) and it is noted that "the vegetation throughout the site is comparable to reference plant communities." However, it is unclear whether reference plant communities have been identified; information regarding the comparison of on-site vegetation to a reference community should be provided. Further, no information indicating that the plant community has not been negatively impacted by the COPCs at the site has been provided. The sixth paragraph should be specific to lead, and HQs

for zinc should not be discussed here.

It should be noted that for DDT the intervention value provided by the MHSPE has been revised to 1.0 mg/kg, for DDD the value is 34 mg/kg and for DDE the value is 1.3 mg/kg (MHSPE, February 2001). Therefore Table 7-20 Step 3 Screening Statistics – SWMU 6 – Surface Soil can be appropriately revised and DDD, DDT, and DDE may be removed from the COPC list.

The discussion of PAHs in soil is very confusing. If the maximum detected concentrations of all PAHs were identified in one sample location, than this area may need to be addressed during the FS or proposed removal action. However, depending upon the sampling frequency this may not mean that PAH exceedances are limited to just one area. Please note that HQs should not be qualified by indicating that a HQ of 4.5 is "low." Any HQ greater than "1" is considered to be associated with risk. The paragraph on PAHs in the soil needs to be rewritten so that the reader has a better understanding where PAH exceedances exist and the risk associated with these exceedances.

54. **Section 7.3.3.2, Surface Water Exposures, page 7-20:** As noted above, HQs should not be qualified as "low;" all HQs greater than "1" are considered to be associated with risk. If the average HQ is greater than 1.0, it is an even stronger indication (compared to maximum HQs being greater than 1.0) that a population-level risk may exist. Total metal concentrations exceeding maximum benchmark concentrations may still present risk to ecological receptors. Elevated concentrations of total metals could result in elevated concentrations of dissolved metals under certain circumstances, depending upon water and soil quality parameters.

55. **Section 7.3.3.3, Sediment Exposures, pages 7-21 and 7-22:** As previously noted, HQs should not be qualified, and all references that HQs were "relatively low" should be removed from the document. The document indicates that the maximum detected concentrations for most of the metals occurred at Station NDW06SD02, and leads the reader to believe that if data from this sampling event were removed and more recently collected data from nearby sample locations (NDW06SD10, -11, -12, and -13) were considered than there would be no exceedances from this area, as concentrations of metals were at or below background and less than screening values. However, this is incorrect: Cu concentrations were above background and screening values at locations NDW06SD10, NDW06SD11, and NDW06SD12. There were also lead and zinc exceedances at NDW06SD10 (Table 4-9 Chemicals Detected Above Screening Criteria and Background levels in Sediment). In fact, even when excluding NDW06SD02 from calculations, the mean concentrations of these compounds at the site exceed background concentrations; in the case of Cu, the mean concentration exceeds the screening value as well. The apparent drop in contaminant concentrations at location NDW06SD02 from 2000 to 2003 may be due to the movement of contaminated sediments (or contaminants in sediment) rather than to erroneous readings having been obtained during the 2000 sampling event.

In the third paragraph, maximum and average concentrations of arsenic, barium, and copper are recalculated by removing Sample NDW06SD02 data from the calculations. Please

provide a table which shows the recalculated concentrations and compares these values to both background concentrations and ecological screening values.

DDD, DDE, and DDT concentrations in sediment were found to be higher than screening values at some sampling locations. As mean HQs based on ERMs were greater than "1" for DDD and DDE, these contaminants should be retained as COCs, and not dropped from further consideration.

It should be noted that eight VOCs rather than six VOCs were identified as PCOCs because no screening values were available for these chemicals. It is unclear how it can be determined that these VOCs are not related to solid waste materials discarded at the site.

56. **Section 7.3.3.4, Food Web Exposures, page 7-22:** As previously noted, the actual models used to calculate hazard quotients, including all input parameters should be provided so that these calculations are transparent (Tables 7-14 and Table 7-23). Further, although Tables 7-9 Ingestion Screening Values of Mammals and 7-10 Ingestion Screening Values for Birds presents the LOAELs and NOAELs obtained from the literature for use in the food chain models, there is no indication as to which specific sets were used in calculating HQs, when more than one set of NOAELS and LOAELs are presented. Therefore, it is difficult to determine whether the conclusions drawn from these HQs are appropriate.

57. **Section 7.3.3.5, DOI Crab Sample Collection at SWMU 6, pages 7-22 and 7-23:** Please present the actual back-calculations used along with the input parameters and NOAELS/LOAELS used to determine concentrations of DDE,DDT, cadmium, lead and vanadium which present no risk to the three species of wading birds modeled.

58. **Table 7-4, Preliminary Assessment Endpoints, Risk Hypotheses, and Measurement Endpoints, pages 7-29 and 7-30:** As discussed above, the assessment endpoint addressing reptile populations should include the *Anolis* as a receptor. It is recommended that the risk to the Pearly-eyed thrasher be calculated solely on the ingestion of soil invertebrates, which it primarily feeds on, rather than including fruits and berries (terrestrial plants), which may minimize the risk from soil contaminants of concern. An omnivorous mouse (house mice [Mus musculus]) would likely represent a more conservative model than the Norway rat or Indian mongoose. See comments above regarding additional appropriate assessment endpoints. Further it should be noted why mammalian carnivores and piscivores were not included as assessment endpoints. In addition, maximum surface water contaminant concentrations should be compared to benchmarks (in addition to sediment chemical concentrations) to assess risk to fish communities. For aquatic habitats, determine whether biota sediment accumulation factors should be used for fish and a dose calculated and compared to threshold reference values.

59. **Table 7-6, Soil Bioconcentration and Bioaccumulation Factors for Plants, Soil Invertebrates, and Small Mammals - Step 2, pages 7-33 and 7-34:** Bioacumulation factors for omnivorous mammals are used to model doses to upper trophic level carnivorous receptors (i.e. red-tailed hawk). However, this may bias the dose because uptake factors for

insectivores, herbivores, omnivores and "general" feeding for soil-small mammals vary (Sample et al.[1998b]). Therefore, it may make more sense to use either the general uptake factors (UFs) (since carnivorous birds are likely to consume whatever small mammals they can get), or, to be conservative, use the highest soil-small mammal UF listed for each contaminant in Sample et al. (1998b).

60. **Table 7-8, Exposure Parameters for Upper Trophic Level Ecological Receptors – Step 2, page 7-38:** Please show allometric equations used to obtain water and food ingestion rates. During the SLERA minimum body weights to maximum ingestion rates should be used. Further, the reference for the soil ingestion rate for the spotted sandpiper is unclear. As noted in the Wildlife Exposure Factors Handbook (EPA/600/r-93/187a December 1993), there is a range of soil ingestion rates for sandpipers (7.3 % - 30%). Since the objective in the SLERA is to be as conservative as possible, it may make sense to either model the spotted sandpiper using the most conservative soil ingestion rate for all sandpipers listed (30% for the Semipalmated sandpiper), or to use the Semipalmated sandpiper (which, while not as common in Puerto Rico, does occur there occasionally) in the food chain models. Please change the page numbers for Tables 7-14 & 7-15 so that they are in numerical order.

61. **Table 7-16, Soil Bioconcentration and Bioaccumulation Factors for Plants, Soil Invertebrates, and Small Mammals – Step 3, page 7-69:** It is unclear how the uptake values were derived for these tables. It is noted that "central tendency estimates (e.g., median or mean)" were used. However, very few of the numbers match the means or the medians listed in the source documents and page 7-16, Section 7.3.1 Refinement of Conservative Screening Assumptions. It is also not clear why the median was chosen for some compounds and the mean for others. Please provide an explanation regarding where these values are from and why they were selected.

62. **Table 7-18, Exposure Parameters for Upper Trophic Level Ecological Receptors – Step 3, pages 7-71 and 7-72:** Please show calculations for allometric equations. The food ingestion rate of the red-tailed hawk is listed as being lower than the food ingestion rate of the green heron. This might make sense if the food ingestion rate was listed on a kilogram per kilogram (kg) body weight per day basis, but it is not; it is listed on a kg/day basis. A 1.13 kg hawk would have to consume more per day than a 0.212 kg green heron. Clarification or correction is needed.

63. **Table 7-23, Summary of Hazard Quotients for Upper Trophic Level Receptors – Step 3, page 7-82:** Please provide some sample calculations with all the receptor inputs such that the calculations are transparent.

64. **Section 8.1, Summary and Conclusions, page 8-1:** The texts states that high salinity is based on high observed TSD reading. According to the table presenting the field results, TSD was not measured, only inferred from conductivity. Salinity is therefore based only on specific conductance. The specific conductance of the surface water samples is consistently lower than that of the groundwater, making it unclear how the report can reach the conclusion that the values are similar, or that the specific conductance of groundwater is due to salinity.

65. **Appendix L, RAGS D Table 1, Selection of Exposure Pathways:** Please include the adult, youth, and child recreator exposure to surface water and sediment as a quantitative evaluation.

66. **Appendix L, Table 2 Series:**

    a. Please update the Region 9 PRG table values. The Region 9 table was updated most recently in October 2004.
    b. The rationale for identifying the COPCs is unclear. There are chemicals which were not detected above screening levels but were retained (antimony in Table 2.1). Please review these tables to ensure that all COPCs were appropriately retained.
    c. Please retain all Group A carcinogens for the quantitative assessment, and add ATOX@ as the rationale. This includes arsenic and benzene in any media in which they were detected, independent of frequency of detection or maximum detected concentration.

67. **Appendix L, Table 3 Series:** Please reference the lastest version of the ProUCL tool.

68. **Appendix L, Table 4 Series:**

    a. Table 4.1RME and others: Please verify the soil to skin adherence factor for the recreational adult. It may be appropriate to use the default value of 0.07 mg/cm^2.
    b. Table 4.3RME and others: For the skin surface area for recreational users, please develop a value that represents areas of the body likely to contact sediment (feet, lower legs, hands, and forearms, for example).
    c. Table 4.9RME and others: Please revise the event time for the adult resident shower time to 0.58 hours.

References

Ministry of Housing Spatial Planning and the Environment, Directorate General for the Environment (DGM), Directorate of Soil, Water and Rural Areas. "Technical Evaluation of the Intervention Values for Soil/sediment and Groundwater." February 2001.

Puerto Rico Environmental Quality Board
Technical Evaluation of the Draft Remedial Investigation
Solid Waste Management Unit (SWMU 6)
Former Naval Ammunition Support Detachment
Vieques Island, Puerto Rico
April 2004

General Comment

1.) The document should include an Acronyms and Abbreviations section to summarize the numerous acronyms and abbreviations that are used throughout the text, figures and tables for the convenience of the reader and to be consistent with other documents prepared for Vieques sites. Many of the acronyms and abbreviations were not initially defined in the customary fashion.

2.) Industrial PRGs are not protective of construction worker exposure. Analytes detected in surface and subsurface soil should be quantitatively evaluated in the HHRA for the construction worker receptor. There is insufficient information in the sections provided for review to determine what analytes were detected in subsurface soil. Although Section 6.5.1 states that soils to 10 feet bls are included in the HHRA evaluation, there is no discussion of analytes in each medium. The discussion presented in Section 6 covers those analytes above screening criteria, which are not appropriate for the construction worker exposure scenario.

3.) Perchlorate detection limits are not low enough to conclude that perchlorate is not present at the site. Analytical results presented in Appendix I indicate that the detection limits were 40 µg/L and 20 µg/L. The report should identify and discuss potential limitations, as well as recommend a corrective action (i.e., resampling and analysis using lower detection limit).

Page-Specific Comments

1. Page ES-5, Paragraph 2 – The cited reference (DoD, 2002) is not presented in Section 9 (References).

2. Page ES-5, Paragraph 4 – Clarify the cited reference for the EPA Ecological Risk Assessment Guidance for Superfund. The paragraph cites "EPA, 1997" which is not presented in Section 9. It is unclear if the correct reference is "EPA 1997a" as presented in Section 9.

3. Page ES-6, Paragraph 5 – The presence of glass and metal debris identified in the report is unsightly, and therefore impacts public welfare, and is hazardous to public safety through physical harm. Paragraph 4 on page ES-5 notes the presence of a chain link fence that presumably limits human access, but not wildlife access. Allowing the debris to remain in place will require protective measures and is not a No Action Alternative. Maintenance on limits to site access such as fencing or institutional controls may be

required in the foreseeable future to prevent risk of physical harm if the remaining waste materials are not removed.

Page 2-1, Section 2.2 - The lateral extent of waste remains a data gap and should be determined. Comments were provided to the Work Plan regarding the limitations of geophysical techniques used and the absence of sufficient field confirmation efforts. The confirmation of the lateral extent of waste is needed to ensure data collection activities provide sufficient coverage of the waste and potentially impacted areas. Note that cross-sections presented in Figures 2-5 and 2-6 do not indicate the estimated depth of waste at SWMU 6.

4. Page 2-4, Section 2.4, Paragraph 2 – The cited reference (Little and Wadsworth, 1964) is not presented in Section 9.

5. Page 2-5, Section 2.6.1, Paragraph 1 – Clarify the discrepancy between the cited reference (ESE, 1988) and the 1986 date on the Environmental Science and Engineering, Inc. citation in Section 9.

6. Page 2-6, Section 2.6.2, Paragraph 1 – The text should provide the depths of the subsurface soil samples that were evaluated in the HHRA.

7. Page 2-6 and 2-7, Section 2.6.3 - A figure should be included in this report that illustrates the extent of the geophysical anomalies in relationship to surface and subsurface soil and groundwater sample locations. Figure 2 in the geophysical report presented in Appendix H does not present this information.

8. Page 2-6, Section 2.6.2, Paragraph 3 – Clarify why the presence of different metals at relatively similar concentrations is indicative background (non-site related) conditions. Cite all sources relied upon to make this assertion.

9. Page 2-7, Section 2.6.5 - The presence of site-related contaminants in the crab tissue should be further discussed. A more comprehensive study should be conducted in order to obtain data sufficient for quantitative analysis in the HHRA. Note that the qualitative analysis of the potential risk associated with contaminant concentrations in crab tissue presented in Section 6.8 is insufficient, as discussed in the comment below. Background crab sample data should be collected from crabs located outside the NASD facility due to the potential for lead contamination from other sites at the facility.

10. Figure 2-2 – Typographic Error. Correct the spelling of "Puerto Rico Conservation Trust" in the legend of this figure.

11. Figures 2-7 and 2-8 – A figure illustrating the waste boundary, like that shown in solid blue on these figures, and the limits of fencing should be prepared and included in the report to allow an independent assessment of the adequacy/suitability of fencing to prevent human exposure to debris remaining at this site.

12. Page 3-3, Section 3.3.1 and Table 3-3 – The report should identify and discuss potential limitations due to monitoring well screen construction depths that are below the water table. Table 3-3 indicates that wells have a 10-foot screen from 3 to 13 bls. Text in Section 2.3.5.2 and well completion diagrams in Appendix C indicate a depth to groundwater that was approximately 1 to 2 feet bls. Therefore, monitoring wells were installed with the tops of the screens up to 2 feet below the water table. This construction method may cause samples to be collected from deeper groundwater and therefore be unrepresentative of shallow groundwater. This method of well construction renders the wells incapable of verifying the absence of floating free product. The text should present a corrective action to document the absence of floating free product.

13. Page 3-9, Section 3.6, Paragraph 6 – The text should be revised to clarify that changes in groundwater flow direction (due to tidal influence) are not ubiquitous across the site.

14. Figure 3-1 – Indicate the location and extent of fencing that prevents unauthorized human access to the site on this figure. This will allow an independent assessment of the proximity and adequacy/suitability of fencing to prevent human exposure to debris remaining at this site.

15. Figure 3-1 – The discrepancy in the number of samples must be clarified. Figure 3-1 illustrates the location of 23 surface soil samples; however, Section 3.2.2 states that 15 samples were collected during the RI.

16. Figure 3-1 to Figure 3-3 – The scale of the three figures should be the same so that the relative locations of the different sample media can be assessed. The locations of surface water and sediment sample locations should be illustrated.

17. Figure 3-6, Tidal Study – Expand the size of the first notation box (MW-1) so that all of the text can be read. The end of the text is currently cut-off.

18. Page 4-4, Section 4.1.4.1, Paragraph 3 – From the second sentence, delete "metals" from "Common organic contaminants include *metals*…"

19. Page 4-4, Section 4.1.4.1, Paragraph 4 – The text must explain the elevated detection limits of 40 ug/L for the 2000 sampling event and 20 ug/L for the 2003 sampling event. The text should identify and discuss limitations to the investigation considering that the screening criterion is 0.36 ug/L. Additional information must be provided to support the conclusion that the detection was likely a false positive. The document must consider that perchlorate is a site-related contaminant of concern and recommend additional sampling and analysis with appropriate sample quantitation limits (considering that the screening criterion is 0.36 ug/L). Based on the 12/20/03 STL email presented in Appendix J, the selected laboratory should use disposable containers, rather than containers that are washed, to eliminate potential cross-contamination.

20. Page 4-6, Section 4.1.5, Paragraph 1 - Provide supporting documentation for the selection of an SSL based on a DAF of 10. A default value of 1 should be used unless it can be

shown that a higher value is representative of site conditions at SWMU 6. The supporting documentation should include the model and input parameter values used to calculate the DAF.

21. Page 4-6, Bullet 5 – Correct the reference "Long, 1995" to read "Long et al. 1995" to be consistent with the reference citation in Section 9.

22. Page 4-7, Bullet 1 – Correct the reference "EPA (1991)" to read either EPA 1991a or 1991b, which ever is applicable, to be consistent with the reference citation in Section 9.

23. Page 4-8, Section 4.2.1 – The report should provide information to support the comparison of background soil samples to site soil samples (i.e., soil type, moisture, etc.). Note that background surface soil sample data should not be combined with subsurface background soil sample data.

24. Pages 4-8 to 4-9, Section 4.2.1.1 – The report should present a table summarizing background data for all inorganics detected in surface soil. Note that the tables provided in Section 6.11 only include those contaminants evaluated in the risk assessment.

25. Page 4-9, Section 4.2.1.3 – The text and Table 4-13 must be revised for consistency. The text states that site-specific and base-wide background surface water inorganic chemicals are included in Table 4-13. However, only site-specific background concentrations are presented in Table 4-13.

26. Page 4-10, Section 4.2.1.5, Paragraph 2 – The essential nutrient evaluation is not an appropriate methodology for eliminating parameters from consideration in the ecological risk assessment. The paragraph must be revised to remove the evaluation and reinstate consideration of the "essential nutrients."

27. Page 4-10, Section 4.2.1.5, Paragraph 1 – Typographic Error. Correct the reference "EPA, 1989" to read "EPA, 1989b" to be consistent with the reference citation in Section 9 (References).

28. Page 4-10, Section 4.2.2.1 - Generic SSLs should not be used to evaluate soils adjacent to coastal water where groundwater is hydraulically connected to surface water, unless the coastal water quality standard is less stringent than the drinking water standard used to calculate the SSL. Although SSL criteria are not available for some metals and organics, SSL criteria should be calculated at a DAF of 1 using the appropriate target groundwater concentration (the more stringent of the coastal water quality standard or drinking water standard). The SSLs for metals should be calculated using soil-water partitioning coefficients (Kds) for the applicable pH of the soils.

29. Page 4-11, Section 4.2.2.1, Inorganic Analytes –
    - The text states that 11 metals were above the screening criteria. However, only seven metals were listed on Table 4-5 that summarizes screening criteria exceedances. Please clarify.

- The text states that eight metals exceed their respective EPA Region IX PRGs. However, according to Table 4-5, only five metals are above the EPA Region IX PRG. Aluminum, manganese, and vanadium are not listed on Table 4-5 but are included in the text as exceeding the EPA Region IX PRG. Please clarify.

30. Page 4-12, Section 4.2.2.1, Semivolatile Organic Compounds –
    a. The number of SVOCs described in the first sentence is inconsistent with the number of SVOCs described in the second sentence. The first sentence states that 20 SVOCs were detected in surface soil samples. However, the second sentence states that the detected SVOCs consisted of "11 PAHs, carbazole, and bis(2-ethylhexyl)phthalate)." Please clarify.
    b. The text states that benzo(a)anthracene was the only SVOC to exceed its SSL. However, carbazole also exceeded its SSL in sample NDW06SS05, as presented in Table 4-5 and as discussed on page 4-13. The text should be corrected.
    c. The text states that an SSL was not available for benzo(a)pyrene. However, Table 4-5 shows an SSL of 4 mg/kg. Please clarify.

31. Page 4-14, Section 4.2.2.2 –
    a. The text should be expanded to include a discussion about the PCB Aroclor analyses performed on subsurface soils.
    b. The text states that antimony was detected in all eight subsurface soils. However, Table 4-11 shows that antimony was detected in only five of the eight subsurface soils. Please clarify.

32. Page 4-14, Section 4.2.2.2 - The depth of the subsurface soil samples should be provided in the text. Note that the use of SSLs to screen subsurface soil data collected from intermittently saturated or fully saturated soil (i.e., smear zone or groundwater matrix samples) is inappropriate. SSLs for organics or mercury do not apply to such a system. Furthermore, SSLs for inorganics do not apply to such a system unless the DAF is equal to 1 and the appropriate criteria mentioned in the comment on Section 4.2.2.1 are used. If subsurface soil samples were collected from subsurface vadose zone soil and not smear zone or saturated soil, they should be screened using SSLs a DAF of 1 unless supporting documentation is provided that demonstrates that a DAF of 10 is protective of groundwater.

33. Page 4-14, Section 4.2.2.2, Paragraph 3 - The list of detected inorganic analytes should be provided in the text. Clarify which of the 23 inorganic analytes were above appropriate background concentrations. The text only discusses those chemicals without SSL criteria. Those inorganics exceeding appropriate background subsurface soil concentrations should be screened using the appropriate SSL (at a DAF of 1 and using the appropriate target groundwater concentration). This paragraph states that of the 12 inorganic chemicals without SSLs, aluminum, calcium, cobalt, iron, magnesium, manganese, and sodium were not detected above their respective background concentrations. Therefore, copper, lead, mercury and potassium were detected above their respective background concentrations and do not have SSL criteria and should be included on Table 4-6 and should be further evaluated in the HHRA.

34. Page 4-14, Section 4.2.2.2, Paragraph 6 – Table 4-6 should list the three SVOCs identified in this paragraph for which SSLs were not available.

35. Page 4-15, Section 4.2.2.3 –
    a. The text lists metals that exceeded screening criteria in unfiltered and filtered groundwater samples. Two of the metals listed (barium and manganese) were incorrect and should be replaced with chromium and lead, as seen in Table 4-7.
    b. The text states that screening criteria were not available for chromium and lead. However, screening criteria are presented for these metals in Tables 4-7 and 4-12. Please clarify.
    c. The background concentrations listed in the text for chromium in unfiltered and filtered groundwater should be reversed for consistency with Table 4-1.

36. Page 4-16, Section 4.2.2.3, Perchlorate – The text states that perchlorate was resampled from the well in which it was detected in 2003 due to the potential for false positive results with the perchlorate method. Perchlorate was not detected in the February 2004 resampling. However, the reporting limit for perchlorate (20 ug/L) was higher than the concentration (12.8 ug/L) detected in 2003. Therefore, it cannot be definitively stated that perchlorate was a false positive in the 2003 sampling round. Both the detected concentration in 2003 and the reporting limit in 2004 exceed the EPA Region IX PRG of 0.365 ug/L. The reason for the elevated reporting limit should be provided; recollection and reanalysis with lower reporting limits should be proposed to provide meaningful data with which to assess the 2003 perchlorate detection.

37. Page 4-16, Section 4.2.2.3, Paragraph 10/11 - The text must explain the elevated detection limits of perchlorate analysis. The text should identify and discuss limitations to the investigation considering that the screening criterion is 0.36 ug/L. Additional information must be provided to support the conclusion that the detection was likely a false positive. The document must consider that perchlorate is a site-related contaminant of concern and recommend additional sampling and analysis with appropriate sample quantitation limits (considering that the screening criterion is 0.36 ug/L).

38. Page 4-17, Section 4.2.2.4, Inorganic Analytes –
    a. The text states that four inorganic chemicals exceeded their respective ecological screening criteria in unfiltered surface water samples. However, five inorganic chemicals exceeded criteria; lead was not included in the list of exceedances. The text must be corrected.
    b. The text states that nickel was detected above its screening criterion in filtered surface water samples. A discussion should be provided on this nickel exceedance, similar to that provided for the other metals exceedances.
    c. The text states that one filtered mercury sample exceeded site-specific background. However, Table 4-13 indicates that the maximum concentration of dissolved (filtered) mercury detected was 0.0452 ug/L which is below the site-specific background concentration of 0.0561 ug/L. Please clarify.

39. Page 4-19, Section 4.2.2.5, Inorganic Analytes –
    a. The text discussion for each metal exceedance incorrectly included the base-wide background concentration although the text states that the listed concentration is the site-specific background concentration. The text must be revised to include the correct site-specific background concentrations.
    b. The text should clarify why there are only 14 total sediment samples for zinc but 19 for all other metals.

40. Page 4-20, Section 4.2.2.5, last sentence – The text states that detected organic chemicals were not above the available screening criteria. However, this is not true for bis(2-ethylhexyl)phthalate, DDD, DDE, and DDT as indicated in Table 4-9 and the paragraphs discussing pesticide results. Please correct.

41. Table 4-1 –
    a. Correct the typographic error on page 4-27. The footnote for "=" has an incorrect spelling for "indicates."
    b. The table has an incorrect spelling for Aroclor (the "h" should be deleted).
    c. The detection of carbon disulfide in the background surface water sample (page 4-22) should be presented and discussed on page 4-16, paragraph 5 (Volatile Organic Compounds).
    d. The table and text should be revised for consistency. Page 4-16, paragraph 5 notes that chloroform was detected in two groundwater samples collected from SWMU 6, but Table 4-1 (Analytical Results from Background Groundwater Samples) indicates that chloroform was non-detect.

42. Table 4-2 -
    a. Correct the typographic error on page 4-34. The footnote for "=" has an incorrect spelling for "indicates."
    b. The table has an incorrect spelling for Aroclor (the "h" should be deleted).

43. Table 4-3 -
    a. Correct the typographic error on page 4-42. The footnote for "=" has an incorrect spelling for "indicates."
    b. The table has an incorrect spelling for Aroclor (the "h" should be deleted).

44. Table 4-5 –
    a. Correct the typographic error on page 4-46. The footnote for "=" has an incorrect spelling for "indicates."
    b. Correct the discrepancies between the PRG date references in the table notes with the citations in Section 9 (References).

45. Table 4-6 –
    a. Correct the typographic error on page 4-47. The footnote for "=" has an incorrect spelling for "indicates."
    b. Correct the discrepancy between PRG date referenced in the table notes with the citation in Section 9 (References).

46. Table 4-7 –
    a. Correct the typographic error on page 4-49. The footnote for "=" has an incorrect spelling for "indicates."
    b. Correct the discrepancy between the PRG date referenced in the table notes with the citation in Section 9 (References).
    c. The table has an incorrect spelling for Aroclor (the "h" should be deleted).
    d. The column for the chemical names should be widened as the full name of the PCBs is truncated.

47. Page 4-50, Table 4-8 – It is unclear why nickel is not presented in this table since it exceeds the ecological criteria and background in one filtered surface water sample, according to Table 4-13. Please clarify and revise as appropriate.

48. Table 4-8 –
    a. Correct the typographic error on page 4-50. The footnote for "=" has an incorrect spelling for "indicates."
    b. Correct the discrepancy between the PRG date referenced in the table notes with the citation in Section 9 (References).

49. Table 4-9 –
    a. Correct the typographic error on page 4-52. The footnote for "=" has an incorrect spelling for "indicates."
    b. The citation "Long, 1995" should be revised to "Long et.al. 1995" to be consistent with the citation in Section 9 (References).
    c. The citation "USEPA, 2000" should be revised to "USEPA, 2000a" to be consistent with the citation in Section 9 (References).

50. Table 4-10 –
    a. Correct the discrepancy between the PRG date referenced in the table notes with the citation in Section 9 (References).
    b. Correct discrepancy between SSL date referenced in the table notes with the citation in Section 9 (References).
    c. Correct the discrepancy between the CH2M Hill date referenced in the table notes with the citation in Section 9 (References).

51. Table 4-11 –
    a. Correct the discrepancy between the SSL date referenced in the table notes with the citation in Section 9 (References).
    b. Correct discrepancy between the CH2M Hill date referenced in the table notes with the citation in Section 9 (References).

52. Table 4-12 –
    a. Correct the discrepancy between the PRG date referenced in the table notes with the citation in Section 9 (References).

- Correct discrepancy between the CH2M Hill date referenced in the table notes with the citation in Section 9 (References). The table has an incorrect spelling for Aroclor (the "h" should be deleted).

53. Page 4-55, Table 4-12 –
    a. The site-specific background concentrations listed for total and dissolved chromium should be reversed for consistency with Table 4-1.
    b. The site-specific background concentrations for chloroform, PCB-1221, PCB-1232, and perchlorate should not be listed as NA, which signifies "Not Available." These compounds were analyzed for in background samples and site-specific background concentrations should be reported as ND, not detected, as indicated in Table 4-1.

54. Table 4-13 –
    a. Correct the discrepancy between the USEPA National Recommended Water Quality Criteria date referenced in the table notes and the citation in Section 9 (References).
    b. The word "Board" is cut short by a formatting error and should be corrected.
    c. Correct the typographic error on page 4-56. The footnote for "=" has an incorrect spelling for "indicates."

55. Table 4-14 –
    a. The citation "Long, 1995" should be revised to "Long et.al. 1995" to be consistent with the citation in Section 9 (References).
    b. Correct the discrepancy between the CH2M Hill date referenced in the table notes with the citation in Section 9 (References).

56. Page 4-57, Table 4-14 – The site-specific background concentrations for bis(2-ethylhexyl)phthalate, DDD, DDE, and DDT should not be listed as NA, which signifies "Not Available." These compounds were analyzed for in background samples and site-specific background concentrations should be reported as ND (not detected), 0.0011 mg/kg, 0.0028 mg/kg, and ND, respectively, for consistency with Table 4-3.

57. Figure 4-7 – Nickel exceeded the screening criterion in one filtered surface water. This exceedance should be included on Figure 4-7.

58. Page 5-3, Section 5.3.2 - An evaluation of migration pathways should be conducted for the purpose of determining what media are likely to be impacted and if future concentrations of contaminants in the receiving media may increase due to on-going migration of contamination. Consideration of current media concentrations exceed screening criteria is irrelevant to determining if a migration pathway exists that may continue to transport contaminants from one media to another.

59. Page 5-3, Section 5.3.3 – The text should include a discussion of those compounds that were detected in soil and underlying groundwater at the site. Site data indicates that lead is leaching from soil to groundwater. Elevated concentrations of lead have been detected in soil and underlying groundwater. Regardless of whether EPA-derived generic

screening criteria exist for a particular contaminant identified at SWMU 6, site data should be evaluated to determine if there is evidence to suggest that site contaminants are migrating.

60. Page 5-5, Paragraph 6 – Correct the discrepancy between the cited ASTDR references for chloroform and the citations in Section 9 (References), which contain no corresponding citations for chloroform.

61. Page 5-6, Paragraphs 1 and 2 – Provide references, where appropriate, for the information concerning the fate and transport characteristics of naphthalene.

62. Page 5-6, Paragraph 4 – Provide references, where appropriate, for the information concerning the fate and transport characteristic of carbazole.

63. Page 5-6, Paragraph 7 and Page 5-7, Paragraph 1 – The reference to "Howard, 1991" should be "Howard et.al., 1991."

64. Page 5-7, Paragraph 2 – Provide references, where appropriate, for the information concerning PAH metabolism identified in this paragraph.

65. Page 5-7, Paragraph 4 – Provide references, where appropriate, for the information concerning the fate and transport characteristics of chlorinated pesticides.

66. Page 5-10, Paragraphs 3, 4, and 5 – Provide references, where appropriate, for the information concerning the fate and transport characteristics of arsenic, antimony, chromium, and selenium.

67. Page 5-11, Paragraphs 1 and 2 – Provide references, where appropriate, for the information concerning the fate and transport characteristics of silver.

68. Page 5-11, Paragraphs 4 and 5 – Provide references, where appropriate, for the information concerning the fate and transport characteristics of iron and manganese.

69. Page 5-11, Paragraph 6 – Provide references, where appropriate, for the information concerning the fate and transport characteristics of thallium.

70. Section 5.5, Paragraph 2 - Lead was detected at 617 mg/kg in surface soil sample SS01. This concentration combined with elevated lead concentrations in other surface soil samples in the vicinity of this location (SS23 and SS13) indicates the presence of a potential hot spot. Furthermore, lead concentrations in groundwater underlying this portion of the site are elevated, suggesting that migration of lead from soil to groundwater is occurring. Therefore, the first sentence of this paragraph should be removed.

71. Section 5.5.1 - The purpose of this section is to evaluate potential migration of contaminants from surface soil to surface water. The inclusion of a discussion of filtered

water samples is irrelevant to the purpose of this paragraph, where overland flow is likely to include particulates. Also, there is no discussion of the location where unfiltered surface water samples exceeded screening criteria. The text should be revised to include a discussion of the spatial relationship between concentrations of particular contaminants detected in surface soil and in surface water samples collected in areas where overland flow from the location of the surface soil sample discharges to surface water.

Whether or not concentrations exceed risk-based criteria is irrelevant to determining if migration of contaminants via this pathway is occurring. Also, since the premise of Section 5.5 is that surface soil is the source of all contaminants in other media, movement of contaminants from soil to groundwater then to surface water should be discussed in this section. Lead, in particular, is present in surface soil and groundwater is hydraulically connected to surface water. This migration pathway should be fully evaluated and discussed.

72. Section 5.5.4, Paragraph 3 - Lead has been detected in surface soil and underlying groundwater. This contaminant is not discussed in this section. Include a detailed discussion of the site data that shows that lead is migrating from soil to groundwater.

73. Section 5.5.4, Paragraph 5 - The text should include and consider the detection limits for the perchlorate analysis. The 2000 data had an elevated detection limit of 40 ug/L, which is 100 times the screening level for perchlorate. The 2003 data had a detection limit of 20 ug/L, which is 50 times the screening level for perchlorate. Further investigation should be conducted to determine if perchlorate is present at this site. A laboratory that can obtain lower detection limits and which uses disposable containers should be used.

74. Figure 5-1 – Clarify why a residential child receptor would be considered exclusive of an adult residential receptor for surface water/sediment exposure.

75. Figure 5-2 – Clarify to what the depth designation 1-7' applies.

76. Figure 5-3 –
    a. A tan box is not provided around NDW06MW02. Correct as needed.
    b. Legend notations for "Top of Quebrada" and "Bottom of Quebrada" do not appear to be needed.

77. Page 6-3, Section 6.2, Paragraph 2 - Crab tissue is also a media of concern for this site and should be included in the exposure model. Site-related contaminants were detected in crab tissue samples collected from crabs located at this site. A subsistence exposure scenario should be quantitatively evaluated in the HHRA. Revise the text and tables accordingly.

78. Page 6-5, Section 6.5.1 – The text should clarify the 10-foot bgs exposure scenario or be revised as appropriate. The scenario considers that subsurface soil as deep as 10 feet bgs could be exposed during construction activities. Section 6.2 states that the depth to groundwater is 1 to 2 feet bgs. It is unclear how subsurface soil will be evaluated to 10

feet bgs. Also, industrial PRGs are not protective of construction worker exposure. All detected compounds in surface and subsurface soil should be included in the dataset used to quantitatively evaluate construction worker exposure via soil.

79. Page 6-5, Section 6.5.1, Third Bullet - EPA Soil Screening Levels for surface and subsurface soils in the vadose zone should be based on a dilution attenuation factor of 1, not 10, unless a site-specific demonstration is made that this DAF is protective of groundwater. Furthermore, SSL criteria for metals are pH-dependent. Therefore, the pH of soil should be determined so that appropriate SSL criteria can be adjusted for pH. All surface and subsurface soil samples should be screened against direct contact criteria. It is not appropriate to screen out chemicals using SSLs, which are transport pathway-derived screening criteria, prior to screening using direct contact criteria. In some cases, the direct contact criteria are lower than the SSLs.

80. Section 6.5.1, paragraph 3 - Provide further discussion on which chemicals were eliminated from further risk consideration and which criteria were used to eliminate each chemical without a PRG.

81. Section 6.6.1, paragraph 2 - Due to the presence of edible wildlife species with detected concentrations of site-related contaminants (i.e., lead, DDT and DDE in land crab tissue) a subsistence scenario should be evaluated quantitatively in the risk assessment. Revise text and tables accordingly.

82. Section 6.6.1.1 - Considering that groundwater is at 1 to 2 feet bgs, it is likely that maintenance workers could be exposed to groundwater during landscape activities. Therefore, dermal exposure to groundwater should be evaluated for this exposure scenario. Revise text and tables accordingly.

83. Section 6.6.1.2, paragraph 2 – As recommended in EPA's RAGS Part E: Dermal Guidance, inorganics should be assessed for the dermal exposure pathway. Since groundwater is not considered a potable drinking water source, all contaminants exceeding appropriate direct contact screening criteria should be carried through the quantitative risk assessment for all complete exposure pathways rather than qualitatively dismissing them. All contaminants should be evaluated quantitatively for the construction worker exposure scenario since appropriate direct contact screening criteria are not available.

84. Section 6.6.2.4 – The text should be modified to provide the appropriate EPA reference for the 2.6 hour recommended Exposure Time for swimming.

85. Section 6.6.2.9 - Construction workers are exposed to surface soil as well as subsurface soil. The exposure point concentrations for construction workers should be calculated using surface and subsurface soil data. Also, the default PEF is not appropriate for construction worker exposure. The EPA guidance referenced in this section provides a method for calculating a PEF for construction worker exposure.

86. Section 6.6.2.10 - Clarify whether chloroform has been eliminated from the groundwater dataset based on an evaluation of laboratory blank concentrations. If chloroform was not detected in the blanks, then it is considered a contaminant of concern for this site and the description as "common laboratory contaminant" should be removed.

87. Section 6.6.3.2, paragraph 3 - Clarify whether total or dissolved concentrations were used in the risk assessment for aluminum, iron and manganese.

88. Section 6.8, paragraph 2 - For screening, the maximum lead concentration should be used. In addition to exceeding residential criteria, the highest lead concentration (617 mg/kg) is over 100 times the lowest concentration (3.58 mg/kg), indicating a potential hotspot that should be evaluated further. Concentrations of lead in groundwater collected from wells located in the vicinity of the elevated surface soil lead concentrations are also elevated. The concentrations of lead in groundwater in MW02, MW03, and MW05 range from 41 ug/L to 97 ug/L, above the coastal water quality standard of 8 ug/L. MW02 was used in the tidal study, which concluded that groundwater is hydraulically connected to surface water, and groundwater hydraulically connected to surface water should meet surface water standards. Lead has also been detected in land crab tissue. Lead is a contaminant of concern for this site that should be evaluated quantitatively using the IEUBK model for children and the Adult Lead Model for adults as recommended in EPA's guidance for performing human health risk analysis on small arms shooting ranges (EPA, XXX). Exposure point concentrations for food resources can be input into these models. Therefore, these models can be used to evaluate the risk associated with the ingestion of lead-contaminated food resources.

89. Page 6-14, Section 6.8, Paragraph 4 - The ingestion of crab under a subsistence exposure scenario should be evaluated quantitatively in the HHRA. The appropriateness of the fish-consumption-based PRGs cannot be confirmed. The PRG values referenced in the text are not provided in Appendix I and the calculations and exposure parameters used in developing these values are not provided. Generic, nationally-based fish ingestion rates are not protective of crab consumption for local residents who may consume higher rates of aquatic organisms than the average US citizen nor is a discussion of the number of meals that can be eaten over a 10-day period of time appropriate for evaluating long-term consumption of crab tissue by island inhabitants. Remove this comparison from the HHRA. Furthermore, DDT and DDE were detected in surface soil in 7 and 12 of 23 samples, respectively. A comparison of the soil concentrations to residential PRGs as a basis for eliminating the ingestion of DDT and DDE in crab tissue is inappropriate. Screening criteria calculated based on incidental ingestion and dermal contact with soil is completely unrelated to the exposure pathway under consideration - the purposeful ingestion of crab tissue. Furthermore, bioaccumulaton of these contaminants in crab tissue is not considered by the qualitative analysis presented here. Remove this discussion from the text. A recommendation for further investigation of impacts to crabs and other local species that may be consumed by island inhabitants and a subsequent evaluation of human risk associated with consumption of these species should be included in the conclusions section of the report.

90. Section 6.8, paragraph 7 - Cumulative risk for each receptor includes risks from all media combined. Risks to receptors presented for various ages should be combined to represent exposure to a resident over 30 years. Separating the 30-year exposure into various age groups (i.e., a child, youth and adult) allows for the evaluation of potentially sensitive exposures relating to age and simplifies calculations, but the overall risk to the receptor is the sum of the risks during each of the age periods.

91. Section 6.10.2 - Thallium, cadmium, antimony, arsenic and iron were not detected in the site-specific background groundwater samples, although the detection limit for thallium in the site-specific background sample is consistent with the detected concentrations in on-site wells. Arsenic and thallium were not detected in the base-wide groundwater samples (detection limits unknown). This specific information should be included in this section rather than a general statement that "most of these groundwater COPCs were also detected in the general background wells and in the two site-specific background wells…" Also include a discussion of those risk drivers that exceeded background concentrations. The maximum arsenic concentration exceeded background by a factor of 3. The maximum selenium concentration exceeded the highest background concentration by a factor of 2. The maximum antimony concentration exceeded the background concentration by a factor of 20.

    Arsenic, antimony and thallium are site-related contaminants, based on an evaluation of surface soil data. Antimony was detected above background and SSL concentrations in surface soil; arsenic was detected above background in soil; thallium was detected above background concentrations. This indicates that these metals are site-related. Note that the use of subsurface soil data results to support the assumption that leaching is not occurring is inappropriate due to the shallow depth to groundwater. The depth of the subsurface soil samples is not provided in this report. However, if they were collected from below 1 to 2 feet bls, they represent aquifer matrix samples, not vadose zone samples. Revise the text accordingly.

92. Section 6.10.2.1 - Total concentrations should be used to determine risk under the assumption that groundwater is a potable drinking water source. The purpose of this section is to discuss background concentrations of antimony. Therefore, remove conclusions or recommendations from this section and include a discussion of background concentrations of antimony in this section.

93. Section 6.10.2.2 - Arsenic was not detected in any background wells. This statement should be included in this section. Also, arsenic was detected in MW02 at a concentration of 51.7 ug/L. This groundwater sample was collected in the vicinity of the following surface soil samples: SS01, which has an arsenic concentration of 7.6 mg/kg; SS23, which has an arsenic concentration of 7.9 mg/kg; and SS13, which has an arsenic concentration of 3.09 mg/kg. The SSL for arsenic is 1 mg/kg at a DAF of 1. These exceedances along with background data indicate that arsenic in surface soil is a site-related contaminant and a source of contamination to groundwater. Revise the text accordingly.

94. Section 6.10.2.7 - Thallium was detected above background concentrations in surface soil samples; therefore, site soils do have elevated thallium levels. This indicates that the presence of thallium is related to site activities. Revise the text accordingly.

95. Section 6.10.3 - Include a discussion of lead concentrations in this section. Elevated lead concentrations have been detected in surface soil, groundwater, sediment and surface water. Elevated lead concentrations in surface soil are related to site activities and surface soil contamination is migrating to all other media. Lead was detected in surface soil sample SS03 at 104 mg/kg. This sample is in the vicinity of sediment samples SD02 and SD10, which have elevated lead concentrations of 144 mg/kg and 95.5 mg/kg. Further investigations and/or actions should be taken to address lead in environmental media, including sediments, due to the presence and potential accumulation of this contaminant in food resources (i.e., crab) at this site.

96. Section 6.11, paragraph 2 - Perchlorate detection limits were not sufficiently low to determine the presence or absence of perchlorate above levels of human health concern. Additional sampling should be conducted and analysis performed by a laboratory that can achieve detection limits at or below 4 ug/L.

97. Section 6.11, paragraph 3 – The Ingestion of Food Resources exposure pathway should be evaluated in this risk assessment. Site-related contaminants have been detected in crab tissue providing for exposure via this scenario. Also, arsenic, antimony and thallium were detected above background concentrations and pose a human health risk at this site through the ingestion of groundwater exposure pathway.

    Further investigation is required to determine the extent of impacts to food resources at the site, to evaluate potential lead hotspots in soil and the potential for migration of metals from surface soil and groundwater to surface water, as discussed in the comments provided.

98. Page 8-6, Paragraph 4 - The citation "EPA, 1997" should be "EPA, 1997a" to be consistent with the citation in Section 9 (References).

99. Page 8-9, Section 8.2 - While detected contamination associated with the SWMU 6 disposal area may have been found to be limited based on the limited data available, this is a not sufficient data set upon which to determine no further action is warranted at the site. Due to the absence of detailed information as to disposal practices and potential contents of waste within SWMU 6, a long term monitoring program must be implemented to assess whether site conditions change over time. Such a program should include, as a minimum, quarterly or semiannual ground water sampling and analysis over a number of years.

    Although unacceptable elevated risks may not be identified based on the limited sampling and analysis conducted to date, given the nature of SWMU 6 as a disposal area, consideration of certain remedial actions are warranted. Isolation of the waste material

needs to be considered. A focused feasibility study is recommended to evaluate potential landfill covers and/or consolidation remedial actions.

100. Page 8-9, Paragraph 3 – The presence of glass and metal debris identified in the report is unsightly, and therefore impacts public welfare, and is hazardous to public safety through physical harm. Maintenance on limits to site access such as fencing or institutional controls may be required in the foreseeable future to prevent risk of physical harm if the remaining waste materials are not removed.

Mr. Christopher T. Penney
Eastern Vieques Project Coordinator
Naval Facilities Engineering Command
6506 Hampton Blvd
Norfolk, VA 23508-1278

Re: RI/FS for SWMU-6, Mangrove Site, Vieques

Dear Mr. Penney:

Enclosed are the Service's comments regarding the draft Remedial Investigation/Feasibility Study (RI/FS) for Solid Waste Management Unit 6 (SWMU-6), also known as the mangrove site, on the western side of the Vieques National Wildlife Refuge. SWMU-6 consists of various trash piles scattered throughout a mangrove estuarine area. This site was first reported by the Navy and its consultants in the late 1970's as part of the initial studies for the Navy's 1979 Vieques Environmental Impact Statement. It was subsequently reported in various Navy sponsored follow up mangrove surveys in the 1980's. The various Land Use Management Plans for the Naval Facility, Vieques, recommended the removal of these trash piles as a top priority. We understand that the existing trash piles will be removed under an ongoing Engineering Evaluation/Cost Analysis (EE/CA) for this site.

SPECIFIC COMMENTS ON VIEQUES REMEDIAL INVESTIGATION REPORT

Section 2 - Site History, Previous Investigations:

P. 2-2:

The report states: "No vegetation stresses were observed in the plant communities." The Service suggests that the lack of visible signs vegetation stress be eliminated as a criterion from site evaluations, because the lack of stressed vegetation on a 26 year old site does not provide any information regarding possible impacts.

P. 2.4:

The report states: "There was no evidence that the site has had an impact on wildlife or habitat." The Service suggests that data needs to be included to substantiate this conclusion.
P. 2.5, Section 2.6.1:

The results of the confirmation study conducted in 1988 (ESE 1988) reportedly included soil concentrations of chromium (Cr) and lead (Pb) of from 18.5 to 48.2 mg/kg and 10.2 to 345 mg/kg, respectively. Chromium and lead concentrations in sediment ranged from 5.28 to 88.4 mg/kg and 2.82 to 312 mg/kg, respectively. In the next sentence, the report states that no elevated levels of any chemicals of concern (COCs) were detected in soil, surface water, or sediment samples. While it appears as though the Remedial Investigation (RI) for SWMU-6 is only reporting the conclusions of the 1988 study, it is unclear what criteria were used to make the assessment that COCs were not elevated. We recommend that this be clarified since several currently accepted benchmarks are below the maximum concentrations reported. For example, Efroymson et al. (1997a,b) report lower soil Cr benchmarks for plants (1 mg/kg), earthworms (0.4 mg/kg), and soil microorganisms (10 mg/kg) , and a lower Pb benchmark for earthworms (50 mg/kg). Similarly, Ecological Soil Screen Levels (EcoSSLs) for Pb in soil are 110 (plants), 16 (birds), and 59 (mammals) mg/kg (U.S. EPA 2003). In marine sediments, the threshold effect level (TEL) for chromium reported by Long et al. (1995) is 81 mg/kg; the TEL listed in MacDonald (1994) is 52.3 mg/kg. The corresponding thresholds for lead are 46.7 and 30.2 mg/kg, respectively. Additionally, while the confirmation study did not recommend additional investigation of the site, it does not appear to have evaluated any inorganic compounds besides Cr and Pb. We recommend that those compounds from the 1988 study whose maximum concentrations exceed the currently accepted benchmarks be reevaluated and the conclusion of the 1988 study regarding additional investigations be modified in necessary.

P. 2.6:

The report states that upgradient and downgradient concentrations of detected compounds were similar. Although not stated specifically in the report, it appears as though average downstream concentrations were compared to maximum background concentrations. It should be noted that at some downgradient sampling locations, maximum detected concentrations of chemicals of potential concern (COPCs) were higher than the maximum background (upgradient) concentration. We recommend that this conclusion be reexamined for those downgradient chemicals that were higher than maximum background concentrations.

The report states that the relative similarity in metal concentrations among different surface soil samples could be an indication that contaminants are present as a result of background conditions, rather than being site-related. We recommend that this statement be deleted as it is conjecture.

P. 2-8 (Table 2-1):

Under the “Findings” column for the confirmation study in 1988, it states, “Two metals were detected”. This implies that other metals were screened for, but not detected. However, in the discussion on p. 2-5 (section 2.6.1) it sounds as though samples were only screened for

chromium and lead (see comment above). The Service requests clarification as to whether other metals, besides Cr and Pb, were evaluated in the confirmation study.

Section 3 - Summary of Field Investigation

P. 3-2:

The discussion of surface soil sampling locations is somewhat confusing. In the third paragraph of this section (3.2.2), the document states that 15 surface soil samples (NDW06SS09 through NDW06SS23) were collected at the site. However, the corresponding figure (3-1) shows an additional eight surface soil locations that are not mentioned in this paragraph. In the fourth paragraph of section 3.2.2, it is explained that an additional eight samples were taken at previous soil boring locations, but only figure 3-2 is referred to as indicating the location where these samples were taken. We suggest that it would be less confusing if figure 3-2 was deleted entirely and a statement to the effect that "Previous soil boring locations sampled during the Expanded Preliminary Assessment/Site Inspection (PA/SI) include NDW06SS01 through NDW06SS08" was added to the third paragraph of section 3.2.2.

In addition on this page, while it is stated that additional surface soil samples were taken to further characterize the horizontal extent of contamination, many of the samples appear to be fairly bunched while other areas appear to be overlooked (for example, close to the water near the western edge of the SWMU). Also, relatively few samples (perhaps 4 of the 23) appear to have been located close to or at the debris piles, where the highest concentrations of COPCs are likely to occur.

Figure 3-1:

Although the text describing the soil sampling locations discusses their placement relative to borings and/or wells, the location of the borings and wells described are not noted on Figure 3-1, making it difficult to determine which soil sample locations are being referring to. For example, the text states that four soil samples were taken to the north, southeast, and west of well NDW06MW04, but since the location of that well is not indicated on Figure 3-1, it cannot be determined which soil samples comprise those four. We recommend that the locations of borings and wells be included in this figure.

Page 3-3:

Both of the monitoring wells installed to assess background conditions are locations very close to the road. We wonder if it is possible for contaminants from the road surface to enter the wells through ground water seepage, thereby artificially increasing background concentrations.

P. 3-6 and Figure 3.4:

The description of samples used for the RI does not include any mention of the locations from the 2000 PA/SI that were not re-sampled. It is confusing that additional sampling locations (NDW06SW01, NDW06SW04) not mentioned in the text are evident in the corresponding figure (Figure 3.4), and it makes it hard to reconcile the text with the figures when the locations and number of samples don't appear to match. We suggest that relevant information about all sampling locations presented in the figures should be included in the text, or the figure should be modified to indicate which samples are from the 2000 vs. the 2003 investigation.

P. 3-7:

We noticed that co-located sediment samples were not taken with the newly collected surface water samples (NDW06SW08 and NDW06SW09). We also noticed that co-located surface water samples were not taken with the newly collected sediment samples (e.g., NDW06SD09, NDW06SD10, NDW06SD12, and NDW06SD14). We recommend that surface water samples or sediments always have a co-located sediment or surface water sample.

P. 3-8:

The discussion of the background locations for surface water and sediment samples is confusing. The first paragraph in section 3.5.3 states that two background surface water and sediment samples were collected from nearby Arenas Lagoon. The next sentence states that two surface water and sediment samples were previously collected from this water body and included in the background sampling report. In the second paragraph of this section, it states that two new surface water and sediment sample were collected from south Kiani Lagoon. These are not located in the site boundary, and so would seem to be background samples (particularly because they are described in the section entitled, "Background Surface Water and Sediment Sampling"). However, in the last paragraph of this section, it states that two background surface water and sediment samples were collected from Arenas Lagoon. Are those the same two referred to in the first paragraph? If so we suggest that, redundancy (and confusion) would be reduced by putting the sample numbers in the first paragraph and deleting the last paragraph entirely. Only two are shown in Table 4.2 (water: locations NDW06SW10 and NDW06SW11) and Table 4.3 (sediment: locations NDW06SD15 and NDW06SD16). Thus, according to these tables, the samples from Kiani Lagoon (locations NDW06SW/SD06B and NDW06SW/SD07B) do not seem to be background samples. We recommend that the Navy clarify or correct this information about the background samples.

P. 3-10:

We suggest that results from the geophysical investigation would be more meaningful if close-ups of the transect lines and interpreted fill boundary were overlain with the outline of the access restriction boundary and sampling locations.

Section 4 - Nature and Extent of Contamination

Tables 4-1 to 4-4 and 4-12 to 4-14:

There are some inconsistencies between the tables listing background concentrations (Tables 4-1 to 4-4) and tables comparing screening values to background concentrations (Tables 4-12 to 4-14). For example, the groundwater summary table (4-12) does not contain background values for the following elements listed in table 4-1 with the qualifier 'J': barium (Ba), beryllium (Be), cobalt (Co), manganese (Mn), mercury (Hg) (there appear to be tap water preliminary remediation goals (PRGs) for all of these compounds), but it does list background values for other elements with the qualifier 'J' (ex. chromium, selenium (Se)). Similarly, the sediment summary table (4-14) does not contain background values for the following elements listed in table 4-3 with the qualifier 'J': beryllium, cobalt, chromium, iron (Fe), manganese, selenium, and vanadium (V). Although most of these compounds are not listed in the sources for the ecological screening values, chromium is listed in both documents cited as sources of the sediment ecological screening values (Long et al. 1995; U.S. EPA 2000). Background values for barium and manganese should be added to Table 4-13, with the screening value listed as 'NA', since no screening values are available from the listed sources. Additionally, the PRGs listed for chromium and lead in Table 4-12 don't match those listed in U.S. EPA (2002). Finally, what does the shading in Tables 4-12 through 4-14 indicate? We recommend you correct or clarify these points.

P. 4-8:

We recommend that all soil background values (from CH2M Hill 2002) used for this RI should be presented in table form; the accuracy of statements comparing concentrations of detected compounds in soil to background levels cannot be adequately assessed without this information.

Table 4-4 (P. 4-43):

We recommend that you identify the source of the daily soil intake rates.

Soils

P. 4-11 and 4-44 (Table 4-5):

Several compounds with detected values exceeding ecological criteria are not listed in this table (Aluminum (Al), Cadmium (Cd), Cr, Mn, V, Thallium (Tl)). For example, the plant benchmark for vanadium is 2 mg/kg (Efroymson et al. 1997b), and this value was exceeded in soil samples from all locations. It is possible that the compounds are not listed because the concentrations do not exceed background levels, but we cannot determine whether this is the case, since background concentrations are not presented. For this entire section as well as the corresponding tables, we feel it would be useful to provide a table that provides a complete list of analytes and the corresponding background concentrations and screening criteria, and indicates which detected compounds do not have screening criteria available.

The list of compounds that exceeded leachability criteria in soil (Soil Screening Levels (SSLs) in Table 4-5) should also include chromium, which has an SSL of 19 mg/kg (using a Dilution/Attenuation Factor (DAF) of 10, as is indicated in the RI/FS). Also, we question why is a DAF of 10 used, instead of the default of 20 as is in the source document (U.S. EPA 2002). (A DAF of 10 is more conservative than a DAF of 20).

Also on P. 4-11, the first paragraph states that "eleven inorganic analytes were detected above screening criteria in at least 1 surface soil sample." This number (eleven) appears to be correct. The second paragraph on this page states, "seven metals...exceeded their respective human health or ecological screening criteria in at least one surface soil sample." In fact, ten metals exceeded ecological screening criteria (Al, Antimony (Sb), Cr, Cu, Fe, Mn, Pb, Tl, V, Zinc (Zn)) and eight metals exceeded their human health screening criteria (Al, Sb, As, Fe, Mn, Pb, Tl, V). Only two metals exceeded the leachability criteria (Sb and Cr). We recommend that this error be corrected.

P. 4-11 to 4-12:

The forth paragraph states, "Each of the [inorganic] chemicals that exceed available screening criteria is discussed below." This is followed by a list of seven analytes. However, a total of 11 inorganic compounds were detected above screening levels (see above); Al, Cr, Mn, and V are missing from the list (see Table I-2 in Appendix I). These compounds are also not listed on the corresponding figure (Figure 4-1). We suggest presenting the background data from CH2M Hill (2002), so that we could determine whether any samples contained concentrations of these compounds that exceeded background.

We also suggest presenting the background data for organics from CH2MHill (2002), because without a presentation of background data, the accuracy of statements comparing sample concentrations of organics in soil to background levels cannot be assessed (with the exception of background values for COPCs in Table 4-10). It should be noted that several discrepancies were found between which metals actually exceeded benchmarks and which compounds are stated to have exceeded benchmarks (see discussion of P. 4-11). There may be similar discrepancies for organic compounds as well.

P. 4-12:

Two additional semivolatile organics (benzo(k)fluoranthene and dibenzofuran) appear to have been detected above ecological screening values and should be mentioned in the discussion on pages 4-12 to 4-13. These include the following exceedences:

Compound	Location	Value (ug/kg)	PRG (ug/kg)	Eco (ug/kg)	SSL (ug/kg)
benzo(k)fluoranthene	W6-SB05	1,230	6,200	100[1]	25,500
	NDW06SS12	205			
	NDW06SS13	509			
	NDW06SS18	173			
Dibenzofuran	W6-SB05	784	29,000	4[1]	NA

[1] Value is from (CCME 1991 and CCME 2002). This comparison assumes the benchmark values for benzo(k)fluoranthene and dibenzofuran are the same in CCME (1991, 2002) as those from CCME (1996), which was not available.

Surface Water

The total metal concentrations should be presented in Appendix I (only dissolved concentrations are included), so the information presented regarding inorganic analytes in unfiltered samples can be verified.

P. 4-18:

Di-n-octyl phthalate was detected in two samples, not one, as is stated in the report. We suggest that this be corrected.

Sediment

P. 4-20:

In the final paragraph on this page, the report says detected organic chemicals were not above the available screening criteria. We noticed that is not the case for bis (2-ethylhexyl phthalate), which was detected above the ecological criterion in two samples (see P. 4-19) or for

dichlorodiphenylethane (DDD), dichlorodiphenylethylene (DDE), and dichlorodiphenyltrichloroethane (DDT), which were detected at concentrations above the screening criteria in two, three, and one sample, respectively (see P. 4-20). We recommend this be corrected.

Appendix I:

Pages I-188 to I-192 are missing.

Table I-2 – We recommend that methylene chloride be in the table of detected chemicals in surface soils (it was detected at locations NDW06SS14, NDW06SS16, and NDW06SS23), although it was measured at concentrations lower than the eco screening value.

Section 6 Human Health Risk Assessment (HHRA)

P. 6-6:

The document states, "Frequency of detection, concentration, site-related use or release, and the structural activity relationships available in the EPA guidance were taken into account in deciding whether to retain each chemical without a PRG for further consideration." It appears from Tables 6-1 through 6-4 that only chemicals exceeding PRGs were retained as COPCs; no compounds without PRGs (or SSLs for subsurface soils) were retained. How were the factors listed taken into account? We suggest that specific reasons why each chemical without a PRG or SSL was not retained be provided.

P. 6-14:

The document states that the screening level for the conservative health protection-based lead concentration protective of a residential child (PRG) is 400 mg/kg. As was pointed out on P. 6-5, the non-carcinogenic PRGs were reduced by a factor of 10 to account for the possibility that multiple chemicals may act synergistically. The screening value in Table 6-11 (p. 6-33) appears to reflect this, since a value of 40 mg/kg is listed. However, by comparing the mean lead concentration (78.5 mg/kg) to the un-adjusted PRG of 400 mg/kg (P. 6-14, second paragraph) the conclusion was reached that there is no unacceptable risk of lead (P. 6-18, first paragraph). Comparing the mean lead concentration to the adjusted screening PRG listed in Table 6-11 would yield a Hazard Quotient (HQ) greater than the target of 1.0. In addition, the average lead concentration is also much higher than the maximum background concentration. We suggest that you reevaluate your conclusion about there being no unacceptable risk from lead.

Table 6-11 (P. 6-33):

It is unclear to us why are maximum and not mean background concentrations presented are and used for comparisons to detected concentrations? We recommend you provide clarity here.

P. 6-18:

The document implies that the elevated iron concentration found at location NDW06SS01 occurred because that location is adjacent to piles of rusted metal debris observed at location NDW06SS23, which also had an elevated iron concentration. However, the two sampling locations are not exactly "adjacent"; appearing approximately 80 feet apart (see Figure 6-2).

P. 6-19:

The document states that none of the wells at the site had dissolved antimony levels above the PRGs. However, according to Table 6-12, one location had a detected dissolved antimony concentration of 1.8 ug/L, which is above the PRG (1.46 ug/L, according to the table). We suggest that the statement be revised.

P. 6-19 to 6-20:

Despite the fact that Cd was not found in elevated concentrations in soils, all Cd concentrations detected in groundwater are above base-wide background levels and PRGs. Additionally, given the degree to which groundwater flows throughout the site (described in previous sections of the report), it seems possible that elevated groundwater concentrations could occur some distance from the source. Therefore we suggest that it might be precipitous to discount the importance of the potential hazard from Cd at the site.

P. 6-20:

The document states that because the soil sampling locations with elevated concentrations of iron do not correspond to the groundwater sampling locations with elevated concentrations of iron, groundwater iron levels do not appear to be related to waste disposal activities at the site. However, given the degree to which groundwater flows throughout the site (described in previous sections of the report), it seems possible that elevated groundwater concentrations could occur some distance from the source. We suggest it might be premature to discount the importance of elevated iron concentrations at the site.

P. 6-21:

The document states that the elevated concentration of Tl found in sediment from location NDW06SD02 may not be site related, "as these samples are collected from the canal that is

separated from the site, near the metal bridge." This statement is confusing; since the site maps indicate that this sampling location is within the boundary of SWMU-6 (see Figure 6-5). Additionally, how is the canal separated from the site? We recommend clarification or revision of the statement.

Comments on Ecological Risk Assessment (ERA) for SWMU-6, Vieques, Puerto Rico

Overall Comments:

Generally, the ERA was performed following standard and accepted practices for analytical procedures and the selection of benchmark values, food chain model parameters, and toxicity reference values. However, we note that there are a few areas which lend uncertainty as to whether the overall conclusions and recommendations (that conditions at SWMU 6 do not pose an unacceptable risk to ecological receptors) are credible. The primary reasons for this uncertainty are:

1) Selection of receptor species:

The receptor species chosen were not generally those that would provide the most conservative estimates of risk. First, the Service suggests that the use of species with lower body weights would have provided higher mass-specific food ingestion rates. Second, we suggest that the use of receptors with more restricted diets (e.g., herbivores or invertivores) in addition to omnivorous species would have provided a more complete assessment of risk, since the risk to receptors could be diluted by the inclusion of multiple food sources, if only some food sources contain high quantities of contaminants. In addition, the food web models for the spotted sandpiper did not use the most conservative soil ingestion estimate.

2) Use of mean HQs in Baseline Ecological Risk Assessment (BERA)

Instead of looking at the hazard quotient obtained for each location separately, the average HQ was calculated across all sample locations. If the average was < 1.0, it was assumed that risks are very unlikely. However, it is possible (and did indeed occur) that COPC concentrations indicate that risk is present at some locations and not others. The authors argue that since they are concerned with population-level effects, and since a conservative area use factor (AUF) of 1.0 was used, average HQs are more realistic than location-specific HQs. We suggest that it seems possible; however, that exposure to high concentrations at a particular location could present risk to even wide-ranging assessment endpoints, depending upon the distribution of resources relative to COPC concentrations.

3) Use of Lowest Observable Adverse Effects Levels (LOAELs) only in determining HQs in BERA

When hazard quotients were calculated, risk was assumed to exist only if LOAEL values were exceeded; No Observable Adverse Effects Levels (NOAELs) were only considered in the Screening Level Ecological Risk Assessment (SLERA). However, the LOAEL is not necessarily the lowest possible adverse effect level, only the lowest reported in the literature used as the source of toxicity reference values. In reality, the lowest adverse effect level is likely somewhere between the LOAEL and the NOAEL. Therefore we recommend, to be protective of sensitive species, HQs calculated using the NOAEL that are > 1.0 should be considered in estimating potential risk.

4) Overlooking the significance of calculated HQs and/or comparisons to background concentrations.

In several cases, HQs > 1.0 were discounted as significant (e.g., when the average concentration was close to the background concentration or where HQs were "close to" 1.0), or, when HQs could not be calculated because screening values were not available, the occurrence of elevated sample concentrations relative to background was discounted as significant (e.g., where elevated concentrations were not "widespread"), leading to the conclusion that there was not an unacceptable level of risk at the site. However, the whole point of using HQs and background concentrations as tools to evaluate risk is to provide a quantitative, unobjective assessment. Therefore we suggest that discounting evidence of risk based on these quantitative approaches seems unjustified.

5) The results of back-calculating minimum contaminant concentrations in crabs that would pose an unacceptable risk to birds foraging at the site from food web models cannot be replicated.

The ERA states that calculations indicated no unacceptable risk exists to avian receptors eating crabs containing the measured concentrations of contaminants. However, the toxicity reference values (NOAELs) used to perform those calculations were developed for other bird species, and were not the most conservative NOAELs listed in the ERA. We suggest that if more conservative NOAELs are used, calculations indicate that risk from DDE and Pb may exist to avian receptors at the site via consumption of crabs.

6) Several errors or discrepancies were found in the report, either between literature sources and data values presented in the ERA or within the document itself. In some cases, for example, additional COPCs should have been retained in the screening level risk assessments. We suggest that the ERA process be completed for all the contaminants with noted discrepancies and then reexamining the new list of COPCs.

<u>SPECIFIC COMMENTS ON VIEQUES SWMU-6 ECOLOGICAL RISK ASSESSMENT</u>:

P. 7-5:

The report states that the species composition and structure of the site and the background location were similar, that no stresses were observed in the plant communities, and that there was no visible evidence that the SWMU 6 site has had an impact on wildlife or wildlife habitat. However, no data are presented to support these statements. We recommend that visible evidence of adverse impacts on a 26 year old site should not be a criterion.

P. 7-9:

The report states that SWMU 6 lacks significant habitat for amphibians and reptiles; however, according to Table 7-1 (P. 7-27), *anolis* lizards were observed at the site. We suggest that since the site is an estuarine mangrove it provides more habitat for amphibians and reptiles then stated in the report and we request that the statement regarding lack of habitat for amphibians and reptiles be reevaluated.

Table 7-4 (P. 7-29):

Selection of receptors: Why was the red-tailed hawk selected as the terrestrial avian carnivore receptor? We suggest a more conservative (i.e., more in line with the first and fourth stated criteria) choice would have been the peregrine falcon, since the peregrine falcon is potentially present on site, and the peregrine falcon, being considerably smaller than the red-tailed hawk, would be expected to have higher mass-specific ingestion rates. Another raptor species which are resident and found in the area would be the American kestrel a permanent resident in Puerto Rico and Vieques. We suggest that any species of omnivorous mouse would likely represent a more conservative model than the Norway rat or Indian mongoose. Depending on the contaminant, a more limited diet may result in higher risk estimates, depending upon the bioaccumulation factors of contaminants in various dietary items.

Table 7-6 (P. 7-33):

The food chain models used in the RI/FS for SWMU-6 used only the biological accumulation factors (BAFs) for omnivorous small mammals (see Sample et al. 1998b) to estimate dietary ingestion of contaminants in carnivorous birds. We note this may not be the most conservative assumption. Depending upon what food item carnivorous birds are assumed to consume, food chain models could end up with very different results, due to the differences in bioconcentration factors in the different types of small mammals. For example, Sample et al. (1998b) list an uptake factor for Cd for soil invertebrate-feeding small mammals that is much higher than that listed for omnivorous small mammals; if shrews were assumed to be consumed by carnivorous birds, higher estimates of risk may have resulted. We recommend it may make more sense to use either the general uptake factors (UFs) (since carnivorous birds are likely to consume whatever small mammals they can get), or, to be conservative, use the highest soil-small mammal UF listed for each contaminant in Sample et al. (1998b).

P. 7-12 & Table 7.7 (P. 7-35):

The sediment to invertebrate BAF values taken from (Bechtel Jacobs Co. 1998a) for As and Hg were not based on depurated worms, but were instead based on both depurated and non-depurated worms. We suggest that values for depurated worms (which happen to be higher than values for all worms combined for As and Hg), should be used for all analytes. In addition, we recommend that maximum surface water contaminant concentrations should be compared to benchmarks (in addition to sediment chemical concentrations) to assess risk to fish communities. The references that exist for water to fish BAFs (for Cd and nickel (Ni)) are much higher than the sediment to fish BAFs used in this ERA.

Table 7-8 (P. 7-37 to 7-38):

Note that several of the references for the values cited (e.g., Dunning 1993; U.S. EPA 1993a,b) are not the original sources. We suggest checking the original references to verify that cited values are correct.

Additionally, it is not clear how the values were arrived using allometric equations. The values do not appear to check out. This is evident even without calculating the ingestion rates, by comparing just the intake rates (e.g., the conservative and central tendency water ingestion rates for the green heron are 0.0227 and 0.0209 L/d; if these were calculated using the corresponding conservative and average body weights [0.158 and 0.212 kg], the second water ingestion calculation would have to yield a larger value, as a result of using the heavier body weight. This is true for food ingestion rates using allometric equations as well). If ingestion rates were expressed on a per unit of body weight basis, then you would expect the conservative value to be higher, but according to the table legends, that is not how ingestion rates are expressed. Perhaps the maximum body weight, rather than the minimum body weight was used, to calculate maximum ingestion rates. We suggest that these calculations be verified and if they are incorrect they be corrected.

Finally, on this page, a soil ingestion rate of 18 percent is listed for the spotted sandpiper, which is said to have come from Beyer et al. (1994). However, the source document does not list a soil ingestion rate for the spotted sandpiper. The value of 18 percent may be the average of the values for all sandpipers listed in Beyer et al. (1994). Since the object in the screen is to be as conservative as possible, we suggest it would make more sense to either model the spotted sandpiper using the most conservative soil ingestion rate for all sandpipers listed (30 percent for the semi-palmated), or to use the semi-palmated sandpiper (which, is an abundant visitor to Puerto Rico throughout the year) in the food chain models.

Table 7.9 and 7.10 (P. 7-39 to 7-46):

The values from Sample et al. (1996), the reference cited for some of the ingestion screening values (LOAELs and NOAELs) for mammals and birds (although, as for the food chain model values, this document is a compilation of results from various sources and so is not the primary literature citation) does not contain all the values used. While we did not check every compound, we couldn't find some of the values used - e.g., the NOAEL for As and the LOAEL for Cr. We suggest that ingestion screening values be verified and correct references added as necessary.

Tables 7-11 to 7-14 (P. 7-47 to 7-68):

What does the shading indicate in these tables?

Table 7-14 (P. 7-67) is out of order, coming after Table 7-15 (P. 7-66).

P. 7-15:

In the Food Web Exposures section, the document states that, "Three pesticides and six Poly Chlorinated Byphenyls (PCBs) were retained as COPCs because the maximum reporting limits exceeded screening values." This text is confusing, since food web exposures are estimated by comparing an ingested dose to NOAELs and LOAELs, rather than using screening values directly. Perhaps the maximum reporting limits for detections below quantification limits as the input into food chain models, and compounds with resulting HQs greater than 1.0 (i.e., dose estimates were greater than toxicity reference values (TRVs)) were retained as COPCs. Therefore, we suggest the text should be clarified or be corrected to better reflect this. Additionally, it is stated that three pesticides were retained as COPCs for the reasons just stated; but hexachlorobenzene was not mentioned, which also should be retained based on HQs > 1.0.

P. 7-16 and Table 7-15 (P. 7-66):

No compounds are indicated in Table 7-15 as being retained for soil (compounds that should be indicated as being retained are listed in the text on P. 7-15). The compounds 4-bromophenyl-phenylether, 4-chlorophenyl-phenylether, hexachlorocyclopentadiene, hexachloroethane, and 1,1,2,2-tetrachloroethylene should not be indicated in this table as being retained, since undetected chemicals without screening values were not identified as COPCs (see last paragraph on P. 7-15).

We recommend summary tables of COPCs retained for sediment and water (similar to Table 7-15, for soil) be presented.

Table 7-16 (P. 7-78):

It is not clear where the values used for the soil to plants, soil to rat, soil to invertebrate, or sediment to invertebrate BAFs originated (cited as being taken from Bechtel Jacobs Co. 1998a,b and Sample et al. 1998a,b). The document states that "central tendency estimates (e.g., median or mean)" were used. Very few of the numbers match the means or the medians listed in the source documents. It is also not clear why the median was chosen for some compounds and the mean for others. We suggest using the values in the source documents to reevaluate the risk estimate unless some compelling reason is suggested for not doing so.

Table 7-18 (P. 7-71):

The food ingestion rate of the red-tailed hawk is listed as being lower than the food ingestion rate of the green heron. This might make sense if the food ingestion rate was listed on a kilogram per kilogram (kg) body weight per day basis, but it is not; it is listed on a kg/day basis. A 1.13 kg hawk would have to consume more per day than a 0.212 kg green heron. We suggest clarification or correction of these numbers.

P. 7-18:

An AET is by definition, the Apparent Effect Threshold; a concentration at which, "a particular adverse biological effect is always expected" (Barrick et al. 1988). Thus, compared to threshold effects levels (TELs) and effects range-low (ERLs), the AETs are fairly high, generally in the range of or higher than the probable effects levels (PELs) and effects range-medium (ERMs). We note AETs are not conservative screening levels and should not be presented as such.

The ERA states that literature screening values could not be found for the several detected volatiles of concern (VOCs); therefore the measured concentrations were compared to the lowest value among screening values for other VOCs. However, screening values for acetone, carbon disulfide, ethyle benzene, methyl ethyl ketone, methylene chloride, and toluene can be found in Jones et al. (1997). It is possible that the screening values for these compounds presented in Jones et al. (1997) were not used because they were derived for freshwater sediments, using equilibrium partitioning (EqP) methodology. However, U.S. EPA Regions 1 and 9 both apply them to marine sediments, and other benchmarks based in part upon freshwater sediment data (from Long and Morgan 1990) were used in this ERA. Using the Jones et al. (1997) screening value for acetone (0.0087 mg/kg) and carbon disulfide (0.85 mg/kg), calculated HQs would be 69 and 16 (acetone) and 26 and 11.4 (carbon disulfide), using the maximum and average concentrations, respectively. Therefore, we suggest that neither acetone nor carbon disulfide should be excluded from consideration as a CPOC.

P. 7-19 to 7-21:

Much of this section compares site COPC concentrations to mean background COPC concentrations; however, in many cases, the degree to which site COPC concentrations exceed mean background concentrations is not evident either from the text or from the corresponding table (7-24), in which only maximum upper threshold limits (UTL) background concentrations are presented. In addition, the background concentrations for Al are not presented, so statements comparing site specific concentrations with background for this COPC cannot be verified.

Evidence of risk from the remaining analytes (soil: Copper (Cu), Fe, Pb, Zn, DDD, DDE, DDT, and six Poly Aromatic Hydrocarbons (PAHs); surface water: Al, Arsenic (As), Ba, Co, Cu, Fe, Pb, Mn, Mn (dissolved), Hg, Ag, Tl, V; sediment: Al, As, Ba, Be, Co, Cu, Fe, Mn, Se, Tl, V, DDD, DDE) is explained away in every case. For example, the risk from some analytes is said to be low if there were only a few areas that exceeded background; if conservative benchmarks are exceeded they are replaced with less conservative values which are not exceeded; if dissolved metal concentrations do not exceed benchmarks, total metal concentrations that do exceed benchmarks are said to be ecologically unimportant; it is even argued that if the maximum values for some analytes are ignored, the re-calculated mean values would be lower than the HQs. We suggest several reasons these arguments are specious:

- In reality, the document is not using the HQs as thresholds to indicate if risk exists; the document implies that because the HQ's are "close to 1" risk is expected to be low. The very reason HQs are used is to quantitatively assess risk and avoid subjectivity.

- One reason for sampling different areas within a site is to determine if and where there are "hot spots". If there are localized areas where risk is shown to exist, remediation efforts can focus on those hotspots, but the risk should not be discounted. There obviously will be variation in COPC concentrations across a site; by sampling at several locations, the likelihood that an accurate depiction of risk at the entire site is obtained is maximized. If only areas that do not show risk above threshold levels are considered, the assessment of risk is biased.

- There are several reasons not to replace conservative benchmarks with less conservative ones after completing the analysis (e.g., replacing soil benchmarks for plants with soil benchmarks for invertebrates, as done in the document). First, conservative benchmarks protect sensitive species. If less conservative benchmarks are used, some species present at the site may not be protected. Second, it has not been conclusively demonstrated that the vegetation at the site was comparable to that at the reference location, or that the plant community has not been affected by COPCs at the site. Third, one reason benchmarks are selected *a priori* is to prevent bias. Benchmarks should not be replaced after analysis for "better" benchmarks which conveniently sweep the risk away. If the optimum benchmarks were not selected beforehand, then the study design was flawed.

- Total metal concentrations exceeding maximum benchmark concentrations may still present risk to ecological receptors. Elevated concentrations of total metals could result in elevated concentrations of dissolved metals under certain circumstances, depending upon water and soil quality parameters.

- Even if the premise that maximum COPC concentrations are not important at a population-wide and site-wide basis is accepted, several contaminants had mean concentrations that exceeded background and benchmark values. If the average HQ is greater than 1.0, it is an even stronger indication (compared to maximum HQs being greater than 1.0) that a population-level risk may exist. To state that risk is low because HQs are "close to" 1.0 when, in fact, the HQ is greater than the threshold of 1.0, negates the fundamental objectivity of using HQs to assess risk.

- For several analytes (soil: Cu, Pb, Zn, PAHs; surface water: Mn, Mn (dissolved), Hg; sediment: As, Ba, Cu, DDD, DDE), not only were **average** HQs greater than 1.0, but **average** (not maximum) concentrations **also** exceeded the **maximum** background concentrations. Some analytes also had a fairly high frequency of exceedence of background UTLs, with soil Pb and Zn showing 15 and 10 exceedences, respectively, out of 23 total samples (see Table 7-24) and Cu in sediment showing 10 exceedences (not counting 6 exceedences for which sample COPC concentrations were estimated) out of 19 total samples (see Table I-2 in Appendix I). To state that risk is negligible seems to be ignoring all evidence to the contrary.

P. 7-21:

The document states that concentrations of metals in sediment samples taken in 2003 at station NDW0SD02 were much lower than samples taken at that location in 2000, with 2003 sample concentrations of Sb, As, Ba, Be, Cd, Co, Cu, Pb, Hg, Ni, Se, Ag, Tl, and V being at or below background and screening values (where available). It goes on to say that, "Additional sediment samples were also collected in September 2003 in the immediate vicinity of NDW06SD02, including NDW06SD10, -11, -12, and -13, and analytical results were comparable among these stations", implying that the concentrations of the metals listed above were also below background and screening values at locations NDW06SD10, -11, -12, and -13. However, this was not always the case: Cu concentrations were above background and screening values at locations NDW07SD10, NDW07SD11, and NDW07SD12. Additionally, concentrations of Al, Fe, and Mn were greater than background at NDW07SD10 and NDW07SD13, and concentrations of Fe and Mn were greater than background at NDW07SD12 (sediment concentrations of Al, Fe, and Mn could not be compared to screening values, since screening values were not available for these compounds). In fact, even when excluding NDW07SD02 from calculations, the mean concentrations of these compounds at the site exceed background concentrations; in the case of

Cu, the mean concentration exceeds the screening value as well. It is not unlikely that sediments have shifted slightly over the three year period; the apparent drop in contaminant concentrations at location NDW07SD02 from 2000 to 2003 may be due simply to the movement of contaminated sediments (or contaminants in sediment) rather than to erroneous readings having been obtained during the 2000 sampling event. We suggest that you do not drop the results from that event from the risk assessment.

The document states that potential toxicity of Be and Tl could not be quantitatively evaluated because screening values are not available for these compounds; this is true of Al, Fe, and Mn as well and needs to be noted in the document.

P. 7-22:

DDD, DDE, and DDT concentrations in sediment were found to be higher than screening values at some sampling locations. The authors then modified the screening values, replacing the procedure quantitation limits (PQLs) with the ERMs, and re-calculated the HQs. As mentioned above, it is not sound science to change the screening values *a posteriori*, as a means of reducing the HQ. Additionally, the ERM is the value at or above which effects would frequently occur (Long and Morgan 1990). Therefore, if the ERM is to be used in lieu of the PQL, an HQ equal to or greater than 1.0 would indicate effects *are likely*. To claim that HQs of 2.2 (for DDD) and 1.1 (for DDE) obtained using the ERMs are sufficiently close to 1.0 to warrant removing these compounds from further consideration is should be reconsidered.

The ERA states that six VOCs were identified as PCOCs because no screening values were available for these chemicals. However, according to Table 7-26, a total of eight VOCs for which screening values are not listed were detected: acetone, carbon disulfide, ethylbenzene, m,p-xylene, methyl ethyl ketone, methylene chloride, oxylene, and toluene. In addition, the ERA states that since these VOCs are not related to solid waste materials discarded at the site, and since "many" are common lab contaminants, their presence may be an artifact of sample handling. However, it is unclear how it can be known with certainty that they are not related to solid waste discarded at the site, since there is little documentation of what or how materials were dumped there. Furthermore, if their presence is an artifact of handling, these VOCs should have been picked up in blank samples analyzed contemporaneously with site samples, which would have resulted in the qualification of field samples during the data quality evaluation. While this was the case for acetone, methylene chloride, m,p-xylene, and toluene, this was not the case for carbon disulfide, ethylbenzene, methyl ethyl ketone (2-butanone), or o-xylene.

Additionally on this page, the discussion of food web exposures only focuses on selenium, which the document states is identified as a PCOC because the NOAEL and LOAEL were both greater than 1.0 for the spotted sandpiper. However, the HQ calculated from NOAELs needs to be taken into account as well. The LOAEL is the lowest observed effect level, not necessarily the lowest effect level. The actual lowest effect level is expected to be somewhere between the

LOAEL and the NOAEL; therefore, basing conclusions on LOAELs alone may underestimate risk to sensitive species. Thus, as indicated in Table 7-23 (P. 7-82), Zn and Hg should be identified as PCOCs in the BERA.

Although a summary of HQ values obtained using food chain models are presented in Tables 7-14 (P. 7-67 to 7-68, step 2) and Table 7-23 (P. 7-82, step 3), the actual models, including input parameters, could not be found anywhere in the document or the appendices. While Table 7-10 (P. 7-43 to 7-46) presents the LOAELs and NOAELs obtained from the literature for use in the food chain models, there is no indication as to which specific sets were used in calculating HQs. For example, four sets of LOAELs and NOAELs are presented for DDD in birds; three of these were based on effects on reproduction and growth, which the text states were preferentially selected as endpoints. We recommend that the document indicate which of these three sets of LOAELs and NOAELs were used to calculate HQs so the conclusions drawn from HQs can be adequately evaluated.

P. 7-23:

The document states that they used the food web model to back-calculate the highest concentrations of COPCs (DDE, DDT, Cd, Pb, and V; identified in the DOI report) in crab tissues that would pose no adverse effects to three species of wading birds (great blue heron, yellow-crowned night heron, and green heron) consuming a diet solely of crabs. The value they obtained for DDE was 1.03 mg/kg (dry weight). For the green heron, this value appears to have been derived using the conservative body weight and food ingestion rate (from Table 7-8, P. 7-37) in conjunction with the NOAEL for the bald eagle (Table 7-10, P. 7-43) (note that body weights and food ingestion rates for the great blue heron and yellow-crowned night heron are not provided in the ERA). Although the NOAEL for bald eagles was likely chosen because this species is somewhat piscivorous, species-specific differences in susceptibility to contaminants, combined with the fact that bald eagles and wading birds are quite different physiologically and taxonomically, makes it not unlikely that the responses of wading birds and bald eagles to COPCs are substantially different. Therefore, we suggest that the most prudent and conservative approach to back-calculating the threshold above which adverse effects could occur would be to use the highest NOAEL measured among all birds, which in the case of DDE would be a value of 0.08, measured for the barn owl (according to the list presented in Table 7-10). If such a calculation is done, the resulting maximum threshold value for the concentration of DDE in crab tissue is 0.276 mg/kg, a value substantially lower than maximum concentrations measured. Similarly, the threshold value for Pb appears to have been calculated using the NOAEL for the kestrel. In addition to the significant taxonomic and physiologic differences that exist between the kestrel and wading birds, the diet is substantially different as well. Because it is impossible to know with certainty whether herons would be more or less susceptible to contaminants than the kestrel, we suggest it would be prudent to use the most conservative NOAEL available; that for the Japanese quail. Performing the back-calculations using the NOAEL for the Japanese quail

results in a maximum dose threshold for Pb of 3.9 mg/kg, which again is substantially lower than the maximum concentration of Pb measured in crabs.
There are no toxicity reference values for vanadium listed in Table 7-10. They appear to have been inadvertently left out, since there are values presented in Sample et al. (1996), which, when used to back-calculate the threshold value for the concentration of V in crab tissue, yields a threshold value of 39.5 mg/kg as is indicated in the ERA. We suggest the correction of Table 7-10 to include the NOAELs and LOAELs for V.

Appendix L, Tables 2.1 to 2.5:

There are several compounds with COPC flags equal to "yes" where the rationale for deletion or selection is identified as "BSL" (below screening level). Other compounds have COPC flags of "no", with the rationale being identified as "ASL" (above screening level). We suggest clarification or correction of this text.

Thank you for the opportunity to comment on this action, if you have any questions please contact Felix Lopez at 787 851-7297 x 226 or Richard Henry US Fish and Wildlife Service, Environmental Response Team, at 732-906-6987 (office), or 973-204-5825 (cell).

Sincerely,

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